00085367

THE
ASIATIC SOCIETY OF BOMBAY
TOWN HALL, BOMBAY-400 023.

ASIATIC SOCIETY MUMBAI

Digitized with financial assistance from the
Government of Maharashtra
on 03 February, 2016

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

JOURNAL

OF A VOYAGE FOR THE DISCOVERY OF A

NORTH-WEST PASSAGE

FROM THE ATLANTIC TO THE PACIFIC;

PERFORMED IN THE YEARS 1819—20,
IN HIS MAJESTY'S SHIPS

HECLA AND GRIPER,

UNDER THE ORDERS OF

WILLIAM EDWARD PARRY, R.N., F.R.S.,
AND COMMANDER OF THE EXPEDITION.

WITH AN APPENDIX, CONTAINING THE SCIENTIFIC
AND OTHER OBSERVATIONS.

85367

---

*PUBLISHED BY AUTHORITY OF THE LORDS COMMISSIONERS
OF THE ADMIRALTY.*

LONDON:

JOHN MURRAY,
PUBLISHER TO THE ADMIRALTY, AND BOARD OF LONGITUDE.

MDCCCXXI.

ASIATIC SOCIETY MUMBAI

910.45
par / JOU
85367

TO

THE RIGHT HONOURABLE THE

LORD VISCOUNT MELVILLE,

FIRST LORD COMMISSIONER FOR EXECUTING THE OFFICE OF LORD HIGH ADMIRAL OF GREAT BRITAIN AND IRELAND, &c. &c. &c.

THIS VOLUME,

CONTAINING

THE JOURNAL OF A VOYAGE FOR THE DISCOVERY OF A NORTH-WEST PASSAGE FROM THE ATLANTIC TO THE PACIFIC,

UNDERTAKEN AND EXECUTED UNDER THE AUSPICES OF HIS LORDSHIP,

IS INSCRIBED,

WITH DUE RESPECT AND GRATITUDE,

BY HIS OBLIGED AND FAITHFUL SERVANT,

WILLIAM EDWARD PARRY.

London, *May*, 1821.

ASIATIC SOCIETY, MUMBAI

ASIATIC SOCIETY MUMBAI

CONTENTS.

PAGE

INTRODUCTION i

Official Instructions xix

CHAPTER I.

PASSAGE across the Atlantic—Enter Davis' Strait—Unsuccessful attempt to penetrate the ice to the Western Coast—Voyage up the Strait—Passage through the Ice to the Western Coast—Arrival off Possession Bay, on the Southern side of the entrance into Sir James Lancaster's Sound 1

CHAPTER II.

Entrance into Sir James Lancaster's Sound of Baffin—Uninterrupted Passage to the Westward—Discovery and Examination of Prince Regent's Inlet—Progress to the Southward stopped by Ice—Return to the Northward—Pass Barrow's Strait—and enter the Polar Sea 29

CHAPTER III.

Favourable appearances of an Open Westerly Passage—Land to the Northward, a Series of Islands—General Appearance of them—Meet with some obstruction from the Islands surrounded with Ice—Remains of Esquimaux Huts, and Natural Produce of *Byam Martin Island*—Tedious Navigation from Fogs and Ice—Difficulty of Steering a Proper Course—Arrival and Landing on *Melville Island*—Proceed to the Westward, and reach the Meridian of 110° W. Longitude, the First Stage in the Scale of Rewards granted by Act of Parliament 53

CHAPTER IV.

Further Examination of Melville Island—Continuation of our Progress to the Westward—Long Detention by the Ice—Party sent on Shore to hunt Deer and Musk-Oxen—Return in Three Days, after losing their way—Anxiety on their account—Proceed to the Westward, till finally stopped by the Ice—In returning to the Eastward the Griper forced on the beach by the Ice—Search for, and discovery of, a Winter Harbour on Melville Island—Operations for securing the Ships in their Winter Quarters 75

CHAPTER V.

PAGE

Precautions for securing the Ships and Stores—for promoting Good Order, Cleanliness, Health, and Good-humour, among the Ships' Companies—Establishment of a *Theatre*, and of the *North Georgia Gazette*—Erection of an Observatory on Shore—Commence our Winter's Amusements—State of the Temperature and various Meteorological Phenomena—Miscellaneous Occurrences to the close of the Year 1819 101

CHAPTER VI.

First Appearance of Scurvy—The Aurora Borealis and other Meteorological Phenomena—Visits of the Wolves—Re-appearance of the Sun—Extreme low Temperature—Destruction of the House on Shore by Fire—Severe Frost-bites occasioned by this Accident . 131

CHAPTER VII.

More temperate Weather—House re-built—Quantity of Ice collected on the Hecla's lower Deck—Meteorological Phenomena—Conclusion of Theatrical Entertainments—Increased Sickness on board the Griper—Clothes first dried in the open Air—Remarkable Halos and Parhelia—Snow-Blindness—Cutting the Ice round the Ships, and other Occurrences to the Close of May 151

CHAPTER VIII.

Journey across Melville Island to the Northern Shore, and Return to the Ships by a different Route 181

CHAPTER IX.

Occurrences at Winter Harbour in the early Part of June—Gradual Dissolution of the Ice upon the Sea, and of the Snow upon the Land—Hunting Parties sent out to procure Game—Decease and Burial of William Scott—Equipment of the Ships completed—Temperate Weather during the Month of July—Breaking up of the Ice near the Ships—Move to the lower Part of the Harbour—Separation of the Ice at the Entrance—Prepare to sail—Abstract of Observations made in Winter Harbour 206

CHAPTER X.

Leave Winter Harbour—Flattering appearance of the Sea to the Westward—Stopped by the Ice near Cape Hay—Further Progress to the Longitude of 113° 48′ 22″.5, being the Westernmost Meridian hitherto reached in the Polar Sea, to the North of America—*Banks's Land* Discovered—Increased extent and dimensions of the Ice—Return to the Eastward, to endeavour to penetrate the Ice to the Southward—Discovery of several Islands—Re-enter *Barrow's Strait*, and survey its South Coast—Pass through Sir James Lancaster's Sound, on our Return to England 228

CHAPTER XI.

PAGE

Progress down the Western Coast of Baffin's Bay—Meet with the Whalers—Account of some Esquimaux in the Inlet called the *River Clyde*—Continue the survey of the Coast, till stopped by Ice in the Latitude of 68½°—Obliged to run to the Eastward—Fruitless attempts to regain the land, and final Departure from the Ice—Remarks upon the probable existence and practicability of a North-West Passage, and upon the Whale-Fishery—Boisterous Weather in crossing the Atlantic—Loss of the Hecla's Bowsprit and Foremast—Arrival in England. . . . 271

APPENDIX.

NO. PAGE

I. An Account of the going of the Chronometers of the Hecla and Griper . . iii

II. Lunar Observations xxi

III. Observations to determine the Latitude and the Longitude by Chronometers . lxi

IV. Abstract of Observations on the Dip of the Horizon at Sea, with Doctor Wollaston's Dip Sector, in 1819 and 1820 ci

V. Magnetic Observations cv

VI. Table of Days' Works kept on board the Hecla cxliii

VII. Tide Table in Winter Harbour, Melville Island clv

VIII. An Account of Experiments to determine the Acceleration of the Pendulum in different Latitudes clxi

IX. Remarks on the State of Health and Disease on board the Hecla and Griper . clxvii

---

LIST OF THE PLATES.

I.	GENERAL Polar Chart, shewing the Track, *&c.*—to *face*	Title Page.
II.	Situation of H. M. Ships Hecla and Griper, July 4th, 1819	11
III.	Iceberg in Baffin's Bay, July, 1819	17
IV.	Chart of the Discoveries, *&c. &c.*	29
V.	Headlands, *&c.*, commencing with Cape Bathurst	31
VI.	Ditto ..... Cape Warrender	32
VII.	Burnet Inlet	34
VIII.	Headlands, *&c.*, commencing with Hobhouse Inlet	35
IX.	Ditto ..... Prince Leopold's Islands	36
X.	Chart of Port Bowen	44
XI.	Headlands, *&c.*, commencing with Cape Cockburn	58
XII.	Situation of the Hecla and Griper, September 20th, 1819	92
XIII.	Cutting into Winter Harbour	97
XIV.	Hecla and Griper in Winter Harbour	122
XV.	Chart of Winter Harbour	226
XVI.	Situation of the Hecla and Griper, 17th to 23d of August, 1820	254
XVII.	Musk-Ox	257
XVIII.	Chart of a Part of the Western Coast of Baffin's Bay	271
XIX.	Esquimaux of the Inlet called the River Clyde	282
XX.	Chart of the River Clyde	288

INTRODUCTION.

HIS Majesty's Government having determined on the equipment of an Expedition to attempt the Discovery of a North-West Passage into the Pacific, the Lords Commissioners of the Admiralty were pleased to honour me with the command; and my Commission for His Majesty's ship the Hecla, was dated the 16th of January, 1819. I arrived in London on the 20th, and commissioned the Hecla at Deptford on the following day. The second vessel appointed for this service was the Griper, gun-brig; she was commissioned by Lieutenant Matthew Liddon, who was directed to put himself under my orders, on the 29th of January.

The Hecla was a bomb, of three hundred and seventy-five tons, built in a merchant's yard at Hull, in the year 1815, of large scantling, and having a capacious hold, which made her peculiarly fit for this service. The Griper was originally a gun-brig, of one hundred and eighty tons; and it was proposed by the Navy Board to raise upon her a deck of six feet, so as to increase her stowage as much as possible. Both ships had been taken into dock about the middle of December, in order to undergo a thorough repair, and to receive every strengthening which the nature of the service demanded.

The number of individuals employed on this service, amounted to ninety-four; their distribution on board each ship will be seen in the following table.

A TABLE shewing the Officers, Seamen, Marines, &c., embarked on board His Majesty's Ships Hecla and Griper.

RANK.	ON BOARD THE HECLA. Officers' Names.	No. of each Rank	ON BOARD THE GRIPER. Officers' Names.	No. of each Rank
Lieutenant and Commander	William Edward Parry	1	Matthew Liddon	1
Astronomer	Capt. Edward Sabine, R. A.	1		
Lieutenant	Frederick William Beechey	1	Henry Parkyns Hoppner	1
Surgeon	John Edwards	1		
Purser	William Harvey Hooper	1		
Assistant Surgeon	Alexander Fisher	1	Charles James Beverly	1
Midshipmen	Joseph Nias William J. Dealey Charles Palmer James Clarke Ross John Bushnan	5	Andrew Reid A. M. Skene William Nelson Griffiths	3
Clerk	James Halse	1	Cyrus Wakeham	1
Gunner	James Scallon	1		
Boatswain	Jacob Swansea	1		
Carpenter	William Wallis	1		
Greenland Master	John Allison	1	George Fife	1
Greenland Mate	George Crawford	1	Alexander Elder	1
Cook		1		1
Leading Men		4		3
Quarter-master		1		1
Gunner's-mate		1		1
Boatswain's-mate		1		1
Carpenter's-mate		1		1
Armourer's-mate		1		1
Sailmaker		1		1
Able Seamen		22		12
Serjeant of Marines		1	Corporal of Marines	1
Privates of ditto		5		4
Serjeant of Artillery Private of ditto	Accompanying Capt. Sabine	2		
	Total	58	Total	36

As an encouragement to the officers, seamen, and marines, who were desirous of being employed on this service, the Lords Commissioners of the Admiralty were pleased to grant to every individual engaged in the Expedition, double the ordinary pay of His Majesty's Navy. The ships were speedily manned with a full complement of excellent seamen; nearly the whole of those who had served on the former Expedition having again volunteered their services, besides numerous others who were anxious to be employed on this occasion.

The mode of fortifying or strengthening the ships was principally the same as that adopted on board the Isabella and Alexander in 1818 *. The Lords Commissioners of the Admiralty were pleased to direct the Navy and Victualling Boards to furnish every thing which the experience of the former voyage had suggested as necessary, and during the whole progress of our fitting, I received the greatest attention and assistance from those Boards, who most readily complied with every wish expressed by me for the more complete equipment of the ships.

The mode of rigging the vessels was that of a barque, as being the most convenient among the ice, and requiring the smallest number of men to work them; a consideration of no little importance, where it was a material object to sail with as few persons as possible, in order to extend our resources to the utmost. The Hecla's mizen-topsail was, therefore, taken away, and the mizen-mast, top-mast, gaff, and driver-boom lengthened, so as to make up, by a large driver and gaff-topsail, nearly the same quantity of after-sail as before; the foremast and mainmast remaining the same as on the former establishment. By this al-

* See the Narrative of the former Voyage.

teration we were enabled to put the ship's company into three watches, a regulation which is well known to tend very essentially to the health and comfort of seamen, while it serves also the important purpose of teaching them their own strength, and increasing their activity on occasions requiring more than ordinary exertion.

The ships were completely furnished with provisions and stores for a period of two years; in addition to which, a large supply of fresh meats and soups, preserved in tin cases, by Messrs. Donkin and Gamble, of Burkitt's essence of malt and hops, and of the essence of spruce, was also put on board, besides a number of other extra stores adapted to cold climates and a long voyage. The anti-scorbutics consisted of lemon-juice (which forms a part of the daily rations on board His Majesty's ships), vinegar, sour-krout, pickles, and herbs; and the whole of the provisions, which were of the very best quality, were stowed in tight casks, to preserve them from moisture or other injury. As a matter of experiment, a small quantity of vinegar, in a highly-concentrated state, recommended and prepared by Doctor Bollman, was also put on board, and was found of essential service, the greater part of the common kind being destroyed by the severity of the frost. In order to save stowage, only a small proportion of biscuit was received; flour, which had been previously kiln-dried with great care, being substituted in its place. For the purpose of baking for the daily consumption of the crews during the winter months, a portable oven was furnished to the Hecla; and after a good leaven had been once obtained, we found no difficulty in baking light and wholesome bread, even in the severest part of the season. The ships were ballasted

entirely with coals, (of which the Hecla stowed seventy, and the Griper thirty-four chaldrons), together with such a quantity of firewood as was necessary for the stowage of the casks in the holds.

To add to our warmth, and to keep out the snow during the winter, a housing-cloth was prepared of the same materials as that with which waggons are usually covered, and which being laid on planks, supported amidships by spars lashed fore and aft between the masts, and resting with their lower ends on the gunwale, completely answered the purpose for which it was intended.

Care was taken to provide abundance of warm clothing, and one suit of the best quality was liberally furnished for each man employed in the Expedition, to be served *gratis* at my discretion. Among the numerous articles of this kind which contributed essentially to our comfort, a wolf-skin blanket was supplied for each officer and man, which, in addition to those of the common sort, effectually kept the people warm in their beds, although from the necessary economy in fuel, the temperature of the decks was frequently much below the freezing point during the nights.

To be prepared against the chances of meeting with any natives in the countries which we were about to visit, the ships were directed to be furnished with a large quantity of various kinds of presents, both to secure their friendship, and to purchase any supplies of which we might stand in need. In short, nothing was omitted which could in any degree tend to the success of the enterprise, or to the health, convenience, and comfort of those engaged in it. I feel myself particularly indebted to the kindness of Commissioner Cunningham, and the officers employed under him in the different departments

of the dock-yard at Deptford, in complying with, and even anticipating, my wishes for the promotion of these objects. My thanks are also due, in an especial manner to my friend Captain Henry Garrett, agent victualler at that port, whose ready attention to all our wants in his public department, could only be equalled by the warm hospitality we experienced from him during the time of our equipment.

While care was thus taken that nothing should be wanting to ensure the success of the Expedition in its main object, the improvement of geography and navigation, as well as the general interests of science, were considered as of scarcely less importance. For this purpose, a number of valuable instruments, (of which a list is subjoined), were furnished to each ship; and Captain Sabine, of the Royal Artillery, who was recommended by the President and Council of the Royal Society, was embarked on board the Hecla, as Astronomer to the Expedition.

Previously to our leaving Deptford, the ships were visited by Viscount Melville, who presided at the Admiralty, as well as by several of the Lords Commissioners, and by the Comptroller of the Navy, who were pleased to express their satisfaction at the manner in which their directions and intentions had been complied with in the general equipment of the Expedition. On the 2d of May, I repaired to the Admiralty, to receive their Lordships' final Instructions for the conduct of the Expedition, a copy of which immediately precedes the Narrative.

List of the Instruments, &c. embarked on board each of the two Ships.

Those marked with an Asterisk were furnished to the Hecla only.

* 2 Astronomical Clocks, with stands.
11 Chronometers on board the Hecla, and four on board the Griper.
* 1 Transit instrument.
* 1 Portable observatory.
* 1 Repeating circle.
1 Dipping-needle. * A second ditto, the property of Henry Browne, esq.
* 1 Instrument for magnetic force, on Captain Kater's improved construction.
* 1 Variation transit.
* 1 Variation needle.
4 Azimuth compasses, on Captain Kater's improved construction.
1 Dip-sector, invented by Dr. Wollaston.
2 Mountain barometers.
2 Marine ditto.
2 Altitude instruments, invented by Captain Kater.
1 Theodolite.
2 Anglometers.
1 Circular protractor.
3 Artificial horizons.
1 Hydrometer.
1 Water-bottle, invented by Dr. Marcet.
10 Thermometers.
* 4 Self-registering ditto, (Sixe's), with iron cases for fastening to the deep-sea lead.
* 2 Electrometers, with chains.

Together with a complete set of drawing instruments, scales, beam-compasses, *&c.* for the construction of charts.

On our return to England, in the beginning of November, 1820, all the journals, logs, charts, and drawings, which had been furnished by every individual belonging to the Expedition, were delivered to the Lords Commissioners of the Admiralty, to be at their disposal; and their Lordships were pleased immediately to direct them to be returned into my hands, for the purpose of preparing for publication, under their authority, an official account of the voyage.

In performing this duty, it has been my earnest endeavour equally to avoid, on the one hand, a too minute and tedious detail of occurrences, which, as the materials for a future account, properly form a part of a manuscript journal, but which, if given in their original form, would only serve to tire by their repetition; and on the other, to omit nothing which came under my notice, and that may be considered interesting, either by the scientific or the general reader. It having been suggested to me that both these purposes would be best answered by throwing into an Appendix the whole of the matter which relates exclusively to geography, natural history, and the details of scientific observations, this method has been adopted; except in a few cases, in which it was considered expedient, for elucidating the subject under consideration, to introduce a brief notice of them into the body of the work, without occasioning any material interruption in the Narrative.

The following account of the proceedings of the Expedition is taken principally from the official Journal kept by myself on board the Hecla, and always written within twenty-four hours after the occurrence of the events recorded in it. In several instances, however, I have been happy to avail myself of the journals or reports furnished by the other officers, in all which cases the obligation is acknowledged

by inverted commas, and by personally mentioning the individual who supplied the account.

The various observations made on board the Hecla during the voyage, have been carefully collected into tables on the model of those of Wales and Bayly, by Captain Sabine, to whom I am indebted for the arrangement of nearly the whole of the Appendix, and for the superintendence of that part of the work during its progress through the press. I feel it no less a duty than a pleasure to acknowledge that, in the performance of this task, Captain Sabine has added another to the many obligations I owe him, for his valuable advice and assistance during the whole course of this voyage, to the credit of which his individual labours have so essentially contributed. Of the manner in which the subject of natural history, contained in the Appendix, has been treated by those gentlemen who did me the favour to undertake the examination and description of the specimens brought home by the Expedition, it does not become me to speak; but I may be permitted to offer them my best acknowledgments for the very handsome and ready manner in which they rendered me their assistance on this occasion.

The Drawings made by Lieutenants Beechey and Hoppner were put into the hands of skilful engravers, soon after the arrival of the ships in the River, such of them being selected for publication as were considered most likely to afford interest or entertainment. It must be confessed, however, that there is little in the scenery of the Polar regions on which the art of the painter can be exercised with advantage; and the opportunities were necessarily the less frequent on the late voyage, in consequence of the length of time which we

were confined to one spot. Of the merit of the drawings made by Lieutenants Beechey and Hoppner, I am not a competent judge, further than as regards the accuracy and faithfulness of the delineation; and to this I am anxious to bear the most unqualified testimony, no less than to the zeal and industry displayed by these gentlemen, whenever opportunities offered of performing this branch of their duty, in compliance with their Lordships' Instructions on that head.

The Charts contained in this volume, comprising surveys of every coast visited by the Expedition during the voyage, are reduced from those drawn on board the Hecla under my immediate inspection, by Mr. Bushnan, Midshipman of that ship, a gentleman well skilled in the construction of charts, and in the art of marine surveying. The original charts are lodged in the Hydrographical Office of the Admiralty, together with a detailed account of all the angles and other materials used in their construction. As it was known that no reliance could be placed on the compasses from the spot where our discoveries commenced (namely, from the entrance of Sir James Lancaster's Sound, westward), it was determined, from the first, altogether to reject magnetic bearings in the construction of the charts, using only those deduced astronomically from the sun's altitude and azimuth, together with its angular distance from the object whose true bearing was required. Astronomical bearings were always thus obtained at the same time with observations for latitude and longitude. Whenever it was considered expedient to take them at other times, the log was of necessity resorted to, in order to obtain the ship's place from the nearest observation; and when this time happened to fall nearly midway

between two observations, the mean of the reckoning, worked backwards and forwards, was taken, to fix the ship's place. In the selection of angles for the construction of the charts, those have, for obvious reasons, been preferred, which were most easterly or westerly, when an observation for latitude was made; and those which were most northerly or southerly, at the time of an actual observation for determining the longitude. When angles only were taken, that is, when the sun was obscured so as to prevent the possibility of obtaining his altitude and azimuth, the angles were used by laying them off from one or more points, whose geographical position had been previously fixed; and by this means, in many instances, the former angles have been found to correspond and intersect accurately, when there would otherwise have been considerable doubt as to the exact place of the ship. The observations for latitude and longitude have been seldom or never made by less than two, and frequently by three or four, observers, and a mean of these used in the construction of the chart. The observers were generally Captain Sabine, Lieutenant Beechey, Mr. Hooper, and myself; the angles were taken with a sextant; sometimes by myself, and sometimes by Lieutenant Beechey, to whose skill and industry in this department of my duty, I am happy to acknowledge myself very materially indebted.

A detailed account having been given by Captain Sabine in the Appendix, of the chronometers used in obtaining the longitudes for the survey, and of the mode of correcting their rates, it is unnecessary for me to add any thing on that subject, the care which has been bestowed upon them being sufficiently apparent on an inspection of the tables. In the daily winding of the chronometers, Captain

Sabine was assisted by Mr. Hooper, purser of the Hecla, a gentleman to whose zeal and exertions, during a period of three years that we have been employed together on this service, I am more indebted than I can adequately express. By those who have been accustomed to the charge of chronometers for any length of time, and who know the weight and importance of that charge, it will be considered as deserving no small credit on the part of these gentlemen, that, for a period of nearly twenty months, during which, eleven chronometers were on board the Hecla, only two instances occurred of a single chronometer being suffered to go down by neglect.

The observations for the variation of the magnetic needle, made on board the ships, have been altogether omitted in the course of the narrative; because, until a correction for the effects of local attraction has been applied, they give little or no information as to the true amount; the whole, therefore, have been referred to the Appendix, in the order in which they were taken. A number of these, obtained for the express purpose of ascertaining the amount of the ship's attraction upon the needle, with her head placed in different directions, and when the dip and true variation were known, will be found useful, perhaps, towards establishing some general formula for the correction of those errors at sea. Such a formula, however, is the less important from the facility with which the amount of this irregularity may at almost any time be found, when the sun is visible, by taking azimuths on a north and south magnetic course, in order to obtain the true variation, and then upon any other required direction of the ship's head. For the purposes of navigation, indeed, it is generally necessary only to ascertain the variation to be allowed on one or more courses, without regard to the *true* amount. This is par-

ticularly the case when magnetic bearings are made use of in the construction of a chart, a mode of surveying which, of course, will only be resorted to when absolutely necessary. In such cases, it will be proper to observe the variation of the needle upon the same course as that on which the bearings are taken; by this means a degree of correctness may be attained, which would be little expected by those who are unaccustomed to adopt this precaution, and most of those errors avoided, which it has been usual to attribute to a defect in the compasses.

To avoid unnecessary repetition in the course of the following Narrative, it must be remarked that all the bearings are the *true* ones, unless otherwise expressly noticed; and the whole of the latitudes are *North*, and the longitudes *West* from the meridian of Greenwich. The temperatures were registered entirely by Fahrenheit's thermometer, and it may be necessary to inform the general reader, that the signs + and − preceding any number of degrees, signify above or below *zero* of that scale.

The temperature of the sea at different depths was obtained, unless otherwise noticed, by Sixe's self-registering thermometer, confined in an iron case, and attached to the deep-sea lead. The bottle used for bringing up water from different depths below the surface, was invented by Doctor Marcet, expressly for the use of this Expedition. It consists of a strong and heavy cylindrical box of cast iron, having a small aperture at each end; through these apertures passes a bolt which, when let down into its place, completely closes them, but when held up by means of a catch in the upper part of the box, allows the water to pass through them freely, both at the top and bottom. Being thus set, it is let down to any depth required, by

a line passing through a hole in a spherical iron weight about the size of a four-pounder shot, which is retained on board till the instrument is low enough; the weight is then let go, and running rapidly down the line, strikes the catch so as to release it, and close the apertures, confining the water which has entered the cylinder. This instrument, from its extreme simplicity, and the certainty with which it obtains the water from a known depth, seems the best of any which has yet been adopted for this purpose.

Care has been taken to avoid, as much as possible, the use of technical expressions, which might serve to render the Narrative unintelligible to any but seamen: as, however, such expressions cannot at all times be dispensed with, especially in the navigation among ice, the nature of which is totally different from any other, I have subjoined an Explanation of the few terms of this kind which occur in the course of my Journal.

I had once thought to have cursorily drawn up a connected Narrative of the numerous efforts and the results of former Expeditions sent out, by this country and other maritime nations, to explore the Arctic regions, from the earliest periods to the present time; but as this would have occupied a considerable space, and, after all, would have been but a brief abstract of what Forster, Burney, and Barrow, have already done, it appeared, on second thoughts, a superfluous undertaking. My motive indeed, it must be frankly owned, was rather of a selfish kind, the gratification of myself and comrades, by thus bringing together the repeated exertions of two centuries, and those of a single voyage, and by instituting a comparison of their results, so favourable and so flattering to all of us

who had the good fortune to be employed on that voyage. Here, however, I must be permitted to say that, whatever the extent of our success may have been, it is to be ascribed, in a great degree, to the zealous and cordial cooperation of Lieutenant Liddon and all the officers of both ships, and the uniform good conduct of the men, to all of whom, collectively and individually, I am most happy in availing myself of this opportunity, of publicly rendering that justice which is so eminently their due.

In closing this introductory part of the work, I would willingly offer a few words by way of apology, for the many faults which, I am but too well convinced, will be found in the stile of the Narrative. It has been said, "*Les marins écrivent mal, mais avec assez de candeur.*" None can feel more deeply than myself the truth of the former part of this assertion; and none, I can with equal sincerity aver, have studied more to deserve the concluding part; but I build my chief hopes of disarming the severity of criticism, on a consideration of that early period of life at which the nature of our profession calls us from our studies, and which, in my own case, drew me away at the age of twelve, and has kept me constantly employed at sea ever since. The extent of my aim has been, to give a plain and faithful account of the facts which I collected, and the observations which were made by myself and others, in the course of the voyage; and these, as far as they go, may be relied on as scrupulously exact. It is for others, better qualified than ourselves, to make their deductions from those facts.

We collected, and have brought home, specimens of the natural productions of those seas and islands which we visited; marking with

care the places at which they were respectively procured; and it is hoped, that the papers in the Appendix, relating to Natural History, will shew that no great loss to that branch of science has been sustained, by the absence of a professional naturalist in the Expedition. In fact, Captain Sabine, in a great degree, supplied the place of a person of this description; and to him, in particular, the Appendix will shew, that science and philosophy stand greatly indebted for a collection of facts and experiments, in a part of the world hitherto but little known, and never before visited by Europeans.

ASIATIC SOCIETY MUSEUM

EXPLANATION OF TECHNICAL TERMS

MADE USE OF IN THE COURSE OF THE FOLLOWING NARRATIVE.

Bay-Ice.—Ice newly formed upon the surface.

Beset.—The situation of a ship, when so closely surrounded by ice, as to prevent her sailing about.

Bight.—An indentation in a floe of ice, like a bay, by which name it is sometimes called.

Blink.—A peculiar brightness in the atmosphere which is almost always perceptible in approaching ice, or land covered with snow.—Land-blink is usually more yellow than that of ice.

Bore.—The operation of "boring" through loose ice consists in entering it under a press of sail, and forcing the ship through by separating the masses.

Clear Water.—The sea unincumbered with ice.

Crow's-Nest.—A circular house, like a cask, fixed at the mast-head, in which the look-out man sits, either to guide the ship through the ice, or to give notice of whales.

Dock.—An artificial dock is formed by cutting out with saws a square space in a thick floe, in which a ship is placed, in order to secure her from the pressure of other masses which are seen to be approaching, and which might otherwise endanger her being "nipped."—A "natural dock" is simply a small bight, accidentally found under similar circumstances.

Field.—A sheet of ice, generally of great thickness, and of such extent that its limits cannot be seen from a ship's mast-head.

Floe.—The same as a field, except that its extent can be distinguished from a ship's mast-head.—A "bay-floe" is a floe of ice newly formed upon the surface.

A Hole, or Pool of Water.—A small space of clear water, surrounded by ice on every side.

Land Ice.—Ice attached to the land, either in floes, or in heavy grounded masses, forced up near the shore by external pressure.

A Lead.—A channel through the ice.—A ship is said to take a right lead, when she follows that channel which conducts her into a clear, or at least, a navigable sea, and *vice versâ*.

Nipped.—To be forcibly pressed between two or more masses of ice.

A Pack.—A large body of loose ice, whose extent cannot be seen.

A Patch of Ice.—The same as a pack, but of small dimensions.

Sailing-Ice.—Ice of which the masses are so much separated, as to allow a ship to sail among them without great difficulty.

A Tongue.—A mass of ice projecting under water, in a horizontal direction, from an ice-berg or floe.—A ship sometimes grazes, or is set fast on a tongue of ice, which may, however, generally be avoided, being easily seen in smooth water.

A Water-Sky.—A certain dark appearance of the sky which indicates clear water in that direction, and which, when contrasted with the blink over ice, or land, is very conspicuous.

Young Ice.—The same as bay-ice.

OFFICIAL INSTRUCTIONS.

By the Commissioners for executing the Office of Lord High Admiral of the United Kingdom of Great Britain and Ireland, &c. &c.

WHEREAS we have thought fit to appoint you to the command of an Expedition, for the purpose of endeavouring to discover a North-West Passage from the Atlantic to the Pacific Ocean; you are hereby required and directed to put to sea in the Hecla, and, in company with the Griper, which, with her commander Lieutenant Liddon, has been placed under your orders, make the best of your way to the entrance of Davis' Strait.

On your arrival in this Strait, your further proceedings must be regulated chiefly by the position and extent of the ice; but, on finding it sufficiently open to permit your approach to the western shores of the Strait, and your advance to the northward as far as

the opening into Sir James Lancaster's Sound, you are to proceed in the first instance to that part of the coast, and use your best endeavours to explore the bottom of that Sound; or, in the event of its proving a strait opening to the westward, you are to use all possible means, consistently with the safety of the two ships, to pass through it, and ascertain its direction and communications; and if it should be found to connect itself with the northern sea, you are to make the best of your way to Behring's Strait.

If, however, you should ascertain that there is no passage through Sir James Lancaster's Sound, but that it is enclosed by continuous land, or so completely blocked up with ice as to afford no hope of a passage through it, you are in that case to proceed to the northward, and in like manner examine Alderman Jones's Sound. Failing to find a passage through this Sound, you are to make the best of your way to Sir Thomas Smith's Sound, which is described by Baffin as the largest in the whole bay; and carefully explore, as far as practicable, every part of it, as well as of any strait you may discover, leading from it into any other sea. On failing to make a passage through this Sound, you are to return to the southward down Baffin's Bay, and endeavour to make your way through Cumberland Strait, or any opening in that neighbourhood which may lead you to the seas adjoining the eastern or northern coast of America; you are then, by whatever course you may have reached these seas, to pursue your voyage along that coast, to the northward or westward to Behring's Strait.

We have hitherto supposed that, on your first arrival in Davis' Strait, the navigation to the northward shall be found practicable. If, however, you should find the contrary to be the case, and that

the sea towards the western side of the Strait is so loaded with ice, as to render it difficult and dangerous for the ships to proceed so far to the northward as Lancaster Sound, at so early a period of the season; it may be advisable, in that case, to endeavour in the first instance, to examine Cumberland Strait, or any other opening that may be likely to bring you to the eastern coast of America, in preference to the loss of time and the danger to the ships, which might be occasioned in persevering too anxiously in the attempt to get to Lancaster Sound; and should you, on your first reaching Davis' Strait, find it to be impracticable to make your way up the western side of the Strait to that Sound, or even to Cumberland Strait, you will understand, that you are at liberty to proceed towards those places, going round by a more easterly track, if the state of the ice, and all other circumstances, should induce you to think it most advisable to do so. Thus, although the track, which we wish you to pursue, if practicable, is pointed out; you will, nevertheless, perceive, that the course to be finally adopted by you for getting to the northward, is, in fact, left to your own discretion, on a careful examination into the state of the ice on your arrival in Davis' Strait; always bearing in mind, that, it is an important object of the Expedition, that Lancaster Sound be thoroughly examined by you, and afterwards those of Jones and Smith, if you should have failed in previously finding a passage to the westward.

Should you be so successful as to find a passage to the westward, it will be advisable to make the best of your way, without stopping to examine any part of the northern coast of America, to Behring's Strait; and if you should fortunately accomplish your passage

through that Strait, you are then to proceed to Kamtschatka (if you think you can do so without risk of being shut up by the ice on that coast), for the purpose of delivering to the Russian Governor, duplicates of all the Journals and other documents which the passage may have supplied, with a request that they may be forwarded over-land to St. Petersburgh, to be conveyed from thence to London. From Kamtschatka you will proceed to the Sandwich Islands, or Canton, or such other place as you may think proper, to refit the ships and refresh the crews; and, if during your stay at such place, a safe opportunity should occur of sending papers to England, you should send duplicates by such conveyance. And, after having refitted and refreshed, you are to lose no time in returning to England, by such route as you may deem most convenient.

If, at any period of your voyage, but particularly after you shall have doubled the north-eastern extremity of America, the season shall be so far advanced as to make it unsafe to navigate the ships, on account of the long nights having set in, and the sea not being free from ice; and the health of your crews, the state of the ships, and all concurrent circumstances, should combine to induce you to form the resolution of wintering in those regions, you are to use your best endeavours to discover a sheltered and safe harbour, where the ships may be placed in security for the winter; taking such measures for the health and comfort of the people committed to your charge, as the materials with which you are supplied for housing-in the ships, or hutting the men on shore, may enable you to do. And, if you shall find it expedient to resort to this measure, and you should meet with any inhabitants, either Esquimaux or Indians, near the place where you winter, you are to endeavour, by every means in your power, to

cultivate a friendship with them, by making them presents of such articles as you may be supplied with, and which may be useful or agreeable to them. You will, however, take care not to suffer yourself to be surprised by them, but use every precaution, and be constantly on your guard against any hostility.

You will endeavour to prevail on them, by such reward, and to be paid in such manner, as you may think best to answer the purpose, to carry to any of the settlements of the Hudson's Bay Company, or of the North-West Company, an account of your situation and proceedings; with an urgent request that it may be forwarded to England with the utmost possible despatch.

In an undertaking of this description, much must, of course, be always left to the discretion of the commanding officer; and, as the objects of this Expedition have been fully explained to you, and you have already had some experience on service of this nature, we are convinced we cannot do better than leave it to your judgment, when on the spot, in the event of your not making a passage this season, either to winter on the coast, with the view of following up next season, any hopes or expectations which your observations this year may lead you to entertain, or to return to England, to report to us the result of such observations; always recollecting our anxiety for the health, comfort, and safety of yourself, your officers, and men; and further considering how far the advantage of starting next season from an advanced position, may not be counter-balanced by what may be suffered during the winter, and by the want of such refreshment and refitting, as would be afforded by your return to England.

We deem it right to caution you against suffering the two

vessels placed under your orders to separate, except in the event of accident or unavoidable necessity, and we desire you to keep up the most unreserved communications with the commander of the Griper; placing in him every proper confidence, and acquainting him with the general tenor of your orders, and with your views and intentions, from time to time, in the execution of them; that the service may have the full benefit of your united efforts in the prosecution of such a service; and that, in the event of unavoidable separation, or of any accident to yourself, Lieutenant Liddon may have the advantage of knowing, up to the latest practicable period, all your ideas and intentions, relative to a satisfactory completion of this interesting undertaking.

We also recommend, that as frequent an exchange take place, as conveniently may be, of the observations made in the two ships; that any scientific discovery made by the one be, as quickly as possible, communicated for the advantage and guidance of the other, in making their future observations; and to increase the chance of the observations of both being preserved.

We have caused a great variety of valuable instruments to be put on board the ships under your orders; of which you will be furnished with a list, and for the return of which you will be held responsible; and we have also, at the recommendation of the President and Council of the Royal Society, ordered to be received on board the Hecla, Captain Sabine, of the Royal Artillery, who is represented to us as a gentleman well skilled in Astronomy, Natural History, and various branches of knowledge, to assist you in making such observations as may tend to the improvement of Geography and Navigation, and the

advancement of science in general. Amongst other subjects of scientific inquiry, you will particularly direct your attention to the variation and inclination of the magnetic needle, and the intensity of the magnetic force; you will endeavour to ascertain how far the needle may be affected by the atmospherical electricity, and what effect may be produced on the electrometer and magnetic needle on the appearance of the Aurora Borealis. You will keep a correct register of the temperature of the air, and of the sea, at the surface and at different depths. You will cause the dip of the horizon to be frequently observed by the dip sector, invented by Dr. Wollaston; and ascertain what effect may be produced by measuring that dip across fields of ice, as compared with its measurement across the surface of the open sea. You will also cause frequent observations to be made for ascertaining the refraction, and what effect may be produced by observing an object, either celestial or terrestrial, over a field of ice, as compared with objects observed over a surface of water: together with such other meteorological remarks as you may have opportunities of making. You are to attend particularly to the height, direction, and strength of the tides, and to the set and velocity of the currents; the depth and soundings of the sea, and the nature of the bottom; for which purpose you are supplied with an instrument better calculated to bring up substances than the lead usually employed for this purpose.

And you are to understand, that although the finding a passage from the Atlantic to the Pacific is the main object of this Expedition, yet, that the ascertaining the correct position of the different points of the land on the western shores of Baffin's Bay, and the different observations you may be enabled to make with regard to the magnetic influ-

ence in that neighbourhood, supposed to be so near the position of one of the great magnetic poles of the earth, as well as such other observations as you may have opportunities of making in Natural History, Geography, *&c.*, in parts of the globe, *&c.*, little known, must prove most valuable and interesting to the science of our country; and we, therefore, desire you to give your unremitting attention, and to call that of all the officers under your command, to these points; as being objects likely to prove of almost equal importance to the principal one before-mentioned, of ascertaining whether there exist any passage to the northward, from the one ocean to the other.

For the purpose, not only of ascertaining the set of the currents in the Arctic Seas, but also of affording more frequent chances of hearing of your progress, we desire that you do, frequently after you have passed the latitude of 65° north, and once every day, when you shall be in an ascertained current, throw overboard a bottle, closely sealed, and containing a paper stating the date and position at which it is launched; and you will give similar orders to the Commander of the Griper, to be executed in case of separation; and, for this purpose, we have caused each ship to be supplied with papers, on which is printed, in several languages, a request, that whoever may find it should take measures for transmitting it to this office.

And although you are not to be drawn aside from the main object of the service on which you are employed, as long as you may be enabled to make any progress; yet, whenever you may be impeded by the ice, or find it necessary to approach the coasts of the continent or islands, you are to cause views of bays, harbours, headlands, *&c.*, to be carefully taken, to illustrate and explain the track of the vessels,

or such charts as you may be able to make; in which duty you will be assisted by Lieutenants Beechey and Hoppner, whose skill in drawing is represented to be so considerable, as to supersede the necessity of appointing professional draughtsmen.

You are to make use of every means in your power to collect and preserve such specimens of the animal, mineral, and vegetable kingdoms, as you can conveniently stow on board the ships; and of the larger animals you are to cause accurate drawings to be made, to accompany and elucidate the descriptions of them: in this, as well as in every other part of your scientific duty, we trust that you will receive material assistance from Captain Sabine.

In the event of any irreparable accident happening to either of the two ships, you are to cause the officers and crew of the disabled ship to be removed into the other; and with her singly to proceed in prosecution of the voyage, or return to England, according as circumstances shall appear to require; understanding that the officers and crews of both ships are hereby authorized and required to continue to perform their duties, according to their respective ranks and stations, on board either ship to which they may be so removed, in the event of an occurrence of this nature. Should, unfortunately, your own ship be the one disabled, you are, in that case, to take the command of the Griper; and, in the event of any fatal accident happening to yourself, Lieutenant Liddon is hereby authorized to take the command of the Hecla, placing the officer of the Expedition, who may then be next in seniority to him in command of the Griper; also, in the event of your own inability by sickness or otherwise, at any period of this service, to continue to carry these Instructions into execution, you are to transfer them to the officer the next in command to you employed

on the Expedition, who is hereby required to execute them in the best manner he can, for the attainment of the several objects in view.

His Majesty's Government having appointed Lieutenant Franklin to the command of an expedition to explore the northern coast of North America, from the mouth of the Copper-mine River of Hearne; it would be desirable, in the event of your touching on that coast, to leave some testimonial of your having been there, with the date, and such circumstances as you may find convenient, for the lieutenant's information; and you will do the same wherever you may stop on that coast, by erecting a pole, having a flag, or some other mark by which it may be distinguished at a distance, (and you should endeavour to place such mark on the situation in which it may be most extensively visible,) and burying a bottle at the foot of it, or otherwise, containing an abstract of your proceedings and future intentions; corresponding instructions having been given to Lieutenant Franklin to leave a similar notice at any convenient part of the coast which he may discover between the mouth of the said river and the eastern part of North America.

You are, while executing the service pointed out in these Instructions, to take every opportunity that may offer of acquainting our Secretary, for our information, with your progress: and on your arrival in England, you are immediately to repair to this office, in order to lay before us a full account of your proceedings in the whole course of your voyage; taking care, before you leave the ship, to demand from the officers, petty officers, and all other persons on board, the logs and journals they may have kept; together with any drawings or charts they may have made; which are all to be sealed up; and

and you will issue similar directions to Lieutenant Liddon and his officers, &c.; the said logs, journals, or other documents, to be thereafter disposed of as we may think proper to determine.

Given under our hands the 1st day of May, 1819.

(Signed) MELVILLE,
G. MOORE,
G. COCKBURN.

By Command of their Lordships,

(Signed) J. W. CROKER.

Lieutenant William Edward Parry
Commanding His Majesty's
Ship the HECLA.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

VOYAGE OF DISCOVERY.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

VOYAGE FOR THE DISCOVERY

OF A

NORTH-WEST PASSAGE.

CHAPTER I.

PASSAGE ACROSS THE ATLANTIC—ENTER DAVIS' STRAIT—UNSUCCESSFUL ATTEMPT TO PENETRATE THE ICE TO THE WESTERN COAST—VOYAGE UP THE STRAIT—PASSAGE THROUGH THE ICE TO THE WESTERN COAST—ARRIVAL OFF POSSESSION BAY, ON THE SOUTHERN SIDE OF THE ENTRANCE INTO SIR JAMES LANCASTER'S SOUND.

THE HECLA and GRIPER were ready to drop down the river in the early part of April; but, the wind continuing to the eastward, the pilots would not venture to turn them down. The wind remained in the same quarter till the beginning of May, beyond which time it would not have been prudent to delay our moving. Application was, therefore, made for a steam-boat to tow the ships to Northfleet, and on the 4th, at eight A.M., the Hecla was taken in tow by the Eclipse, of sixty-horse power. With a fresh breeze right a-head, she moved at the rate of three miles and a half an hour through the water, and was made fast to the buoy at Northfleet at a quarter past noon. The steam-boat returned to Deptford for the Griper, and arrived with her at night. 1819. May.

The guns and gunner's-stores were received on baord on the 6th; and, all the iron being now stowed, as it would probably remain for the rest of the voyage, the afternoon of that day was occupied in obtaining some steady observations on the irregularities of the magnetic needle on board the Hecla, by turning her head round to each point of the compass in succession. These observations will be found in the Appendix.

1819. May. The ships took their powder on board on the 7th, and moved to the Lower-Hope. On the evening of the following day they anchored at the Nore, where the instruments and chronometers were embarked. I furnished Lieutenant Liddon with a complete copy of the Instructions which I had received from the Lords Commissioners of the Admiralty, together with an order containing general directions for the economical use of the provisions and stores, and for the mode of registering the various observations to be made during the voyage; appointing also certain places of rendezvous in case of unavoidable separation.

Captain Sabine went on shore at Garrison-Point, on the 9th, to make observations on the magnetic force with some needles of a new construction by Captain Henry Kater. Of these observations an account by Captain Sabine will be found in the Appendix.

Commissioner Boyle came on board on the evening of the 10th, to superintend the payment of the arrears of wages, and three months' advance, to the seamen and marines. On the following day, when the men had supplied themselves with a sufficient stock of clothes, according to a list which had been previously issued, the ships weighed at ten A.M., and at noon were abreast the Nore-light. The wind being free, the Hecla, at sunset, had outsailed the Griper about three miles.

Wed. 12. Finding the Griper continued to detain us this morning, I determined to take her in tow, and at three P.M. we ran through Yarmouth Roads, but anchored in the evening with the flood-tide, the wind being too light to enable the ships to stem it. Soon after midnight we again weighed, the Frid. 14. wind having got round to the N.b.W. On the morning of the 14th, in beating to the northward, the Hecla touched the ground on the east end of Sheringham-Shoals, Cromer Light-house bearing S.b.E. per compass. The pilot should not have brought it to the eastward of south, on which bearing there is no danger. Finding the ships made no way, and that it would not be practicable to anchor with the lee-tide, we bore up for Yarmouth Roads, and anchored within the Cockle Gat at two P.M.

Sat. 15. At noon on the following day, while getting under way, I received a visit from Captain Wells, of His Majesty's sloop the Wye, who kindly offered every assistance in his power, and sent us our last supply of English beef, as we passed his ship. A favourable breeze springing up on the morning of Sun. 16. the 16th, the Griper was taken in tow, and at two P.M. on the 19th, we made Wed. 19. Fair Island.

It fell calm in the evening, and several fine cod *(Gadus Morhua)* and coal-fish *(Gadus Carbonarius)* were caught; the centre of the island bearing N.E. half N. per compass, distant eight or nine miles. This was the last supply of fresh fish that we obtained during the voyage. It was light enough at midnight, to see Fair Island distinctly at the distance of ten miles. 1819. May.

On the 20th, we spoke the Danish brig David Eske, from Copenhagen, bound to Disko Island. The Griper was taken in tow again in the evening, and we rounded the northern-point of the Orkneys, at the distance of two miles and a half, having from thirty to thirty-six fathoms of water. Thur. 20.

We made the island of Rona on the 21st., and Bara on the following morning. The position of these islands by our observations is: Frid. 21. Sat. 22.

	BARA.	RONA.
Latitude,	59° 04′ 24″.	59° 05′ 54″.
Longitude,	6° 14′ 34″.	5° 52′ 04″.

As we ran along to the northward of them, at the distance of six or seven miles, the soundings were from fifty to seventy-five fathoms, the deepest being off Bara, on a bottom of gravel, coarse sand, and broken shells.

It is recommended by the most experienced of the Greenland Masters, to cross the Atlantic to Davis' Strait, about the parallel of 57½° or 58°, and I shaped our course accordingly. A bottle was thrown overboard, containing a printed paper, stating the date and the situation of the ships, with a request, in six European languages, that any person finding it would forward it to the Secretary of the Admiralty, with a notice of the time and place where it was found*. One bottle, at least, was thrown out daily during the voyage, except when the ships were "beset" in the ice.

The wind being right aft on the morning of the 24th, the Griper, still in tow, took the wind out of our sails, and forged a-head, obliging us to cast off the hawser. Soon after noon we made Rockall; its latitude, by our observations, was 57° 38′ 40″, and its longitude 13° 47′ 42″. The geographical position of this remarkable rock was determined by Captain Capel, in 1818, to be lat. 57° 39′ 32″, long. 13° 31′ 16″, which is to be preferred to Mon. 24.

* The purpose intended to be answered by this kind of communication, will be best understood, by referring to my Instructions from the Lords Commissioners of the Admiralty.

1819. May. ours, owing to the distance at which we passed it. There is, perhaps, no more striking proof of the infinite value of chronometers at sea, than the certainty with which a ship may sail directly for a single rock like this, rising like a speck out of the ocean, and at the distance of forty-seven leagues from any other land. At seven P.M., the Griper having again dropped five or six miles astern, we hove to for her to come up; and, taking this opportunity to try the temperature of the water below the surface by Six's self-registering thermometer, we unexpectedly obtained soundings in one hundred and forty fathoms, on a bottom of very fine white sand, Rockall bearing S. 85° E., distant thirty miles and three-quarters. The temperature of the water at the bottom was 47¾°, that of the surface being 49½°, and of the air 50°. The Griper was again taken in tow, with a breeze from the eastward, which in-

Tues. 25. creased to a fresh gale the following morning, when the hawser, by which we towed the Griper, gave way; we hove to for her in the evening, being in lat. 57° 04′ 10″, long. 17° 52′ 50″, when some water was brought up from one hundred fathoms' depth in the bottle contrived by Doctor Marcet; its specific gravity was 1.0268, at the temperature of 58°. that of the surface water being the same. The temperature of the water at the same depth was 49°, that of the surface being 50°, and of the air 50½°.

Thur. 27. On the 27th, we cast off the Griper, and hauled a little to the northward, in order to pass near the spot where Lieutenant Pickersgill obtained soundings, from three hundred and twenty to three hundred and thirty fathoms, on the 29th of June, 1776; and, at six P.M., being in lat. 56° 59′ 39″, and long. by chronometers, 24° 33′ 40″, the deep-sea clamms were sent down with one thousand and twenty fathoms of line, without finding bottom. The temperature of the sea at that depth was 45½°, that of the surface being 48½°, and of the air 49°.

Frid. 28. It fell calm towards noon on the 28th, the ship being in lat. 57° 26′ 16″, long. 25° 11′ 51″. The current was tried in a boat moored by an iron kettle, in the usual way, but not the smallest stream was perceptible. Six's thermometer was sent down to one hundred and twenty fathoms, but did not indicate the temperature, owing to the mercury rising past the index, instead of pushing it up before it; a failure I have often had occasion to regret in this useful instrument, when thus exposed to a very sudden change of temperature. It might, perhaps, be improved for this particular purpose, by making the lower end of each index a little larger, so as to prevent the passage of the mercury between it and the tube. Some water, from one

hundred and thirty fathoms' depth, was at the temperature of 48° on coming to the surface, that of the surface being 49°, and of the air 49°. Its specific gravity was 1.0266 at the temperature of 61°, being the same as that of the surface-water. 1819. May.

The wind veered to the westward on the 30th, and increased to a fresh gale, with an irregular sea, and heavy rain, which brought us under our close-reefed topsails. At half-past one, P.M., we began to cross the space in which the "Sunken Land of Bus" is laid down in Steel's chart from England to Greenland; and, in the course of this and the following day, we tried for soundings several times without success, the ship's position being as follows: Sun. 30.

LATITUDE.	LONGITUDE.	FATHOMS.
57° 46′	29° 20′	160
57 49	29 22	90
58 02	29 32	80
58 07	29 34	85
58 14	29 46	100
58 13	30 52	170

This being the anniversary of His Majesty's birth-day, and the weather being calm and fine, I directed an additional allowance of grog to be served out, or, in seamen's phrase, "the main brace to be spliced." In the evening, being then in lat. 55° 01′, and long. 35° 56′, we tried for soundings with two hundred and fifty fathoms of line, without finding bottom. The temperature of the sea at that depth was 44½°, surface 44¼°, air 43°. June. Friday 4.

On the 7th and 8th, we had hard gales from the westward, with a heavy sea. Indeed, from the 1st to the 14th of June, we experienced a continued series of unfavourable winds and unpleasant weather, so that very little progress could be made to the westward. 7 and 8.

On the 13th, being in lat. 57° 51′, and long. 41° 05′, the temperature of the sea, at two hundred and thirty-five fathoms' depth, was found to be 39°, surface 40½°; air 41½°. A very slight current was found to set to the southward. We saw, to-day, large flocks of sheerwaters *(Procellaria Puffinus)*, called by the sailors, "cape hens," from an idea that they are only to be found near Cape Farewell. I do not remember to have met with these birds in any other part of Davis' Strait, or in Baffin's Bay. Sun. 13.

On the 15th, a breeze sprung up from the eastward, and at noon we very Tues. 15.

1819. June. unexpectedly saw land at a great distance, bearing due north. This could be no other than the land about Cape Farewell, of which the longitude, by our chronometers, being the same as that of the ship, was 42° 56′ 41″, agreeing nearly with that given in the tables of Maskelyne, Mendoza Rios, and Robertson, and in the *Connaissance des Tems*, being from 2° to 3° to the eastward of the position assigned to it in most of the charts. This accounts for a remark, which is common among the whalers, that they always make this headland in coming from the eastward, sooner than they expect; a circumstance which they naturally attribute to the effect of a westerly current. If the latitude of Cape Farewell be so far to the northward as 59° 37′ 30″, which is the mean of nine different authorities, our distance from it this day must have been more than forty leagues. It is by no means impossible that the bold land of Greenland may be distinguished at so great a distance; and it is proper to remark, that the weather, at the time we saw it, was precisely that which is said to be most favourable for seeing objects at a great distance, namely, just before or after rain, when the humidity of the atmosphere increases its transparency *.

Wed. 16. Thur. 17. The wind again backed to the westward on the 16th, and we stretched to the northward towards the land. On the evening of the 17th, being in lat. 58° 52′, and long. 48° 12′, the colour of the water was observed to be of a lighter green than that of the ocean in general; but we could find no soundings with two hundred and ninety fathoms of line. The temperature of the sea at that depth, was 38¾°, of the surface, 38½, and of the air, 38½°.

Frid. 18. Early in the morning of the 18th, in standing to the northward, we fell in with the first "stream" of ice we had seen, and soon after saw several icebergs. At daylight the water had changed its colour to a dirty brownish tinge. We had occasion to remark the same in entering Davis' Strait in 1818, when no difference in its temperature was perceptible. The temperature of the water this morning was 36½°, being 3° colder than on the preceding night; a decrease that was probably occasioned by our approach to the ice. We ran through a narrow part of the stream, and found the ice beyond it to be "packed" and heavy. The birds were more numerous than usual; and, besides the fulmar petrels, boatswains, and kittiwakes, we saw, for the first time, some rotges *(Alca Alle,)* dovekies, or black guillemots *(Colymbus Grylle,)* and terns *(Sterna Hirundo,)* the latter known best to seamen by the name of the Greenland swallow. Soon after noon, being in lat. 59° 40′, long. 47° 46′, and the water being

* Humboldt. Personal Narrative, I. pp. 81. 101, 102.

of the same colour as in the morning, we tried for soundings, but could find no bottom with two hundred and sixty fathoms. The temperature of the sea at that depth was 39°, that of the surface being then 37°, and of the air 35°. The specific gravity of the surface water which at noon was 1.0262, at the temperature of 56°, had decreased to 1.0257, at that of 57°. On the 19th, at noon we were in latitude, by observation on the ice, 59° 48′ 26″*, and in longitude, by the chronometers, 48° 01′ 50″, when a current was found to set S. 50° W. at the rate of six miles per day. A breeze springing up from the eastward, we bore away to the W.N.W., through rather close "sailing ice." The fog which had prevailed during the day cleared away in the evening, and discovered to us the coast of Greenland, bearing from N. 3° W. to N. 62° E., at the distance of twelve or thirteen leagues. On the following morning a very remarkable hill, being the highest land in sight, was found, by a base measured by Massey's patent log, to be in lat. 60° 53′ 29″, and long. 48° 42′ 22″. This position answers nearly to an island called Noua in Arrowsmith's chart, a little to the eastward of Cape Desolation. The water still continued of the same dirty colour as before; but at half past four P.M., when we hove to, for the purpose of taking the Griper in tow, we could find no bottom with a hundred and forty fathoms of line. On the evening of the 21st, having run to the westward as far as 55° 01′ W. in the lat. of 61° 26′, we observed the colour of the water to have changed from the brownish tinge before-mentioned, to a light bluish green; and it is remarkable that its specific gravity was found to have increased, within a few hours, from 1.0257 to 1.0261, both being at the temperature of 57° when weighed. These experiments seem to confirm those made on the 18th, and to render it highly probable, that the brown colour remarked in the sea was occasioned by the admixture of a large portion of fresh water, supplied by the melting of the snow and ice.

1819. June. Sat. 19. Sun. 20. Mon. 21.

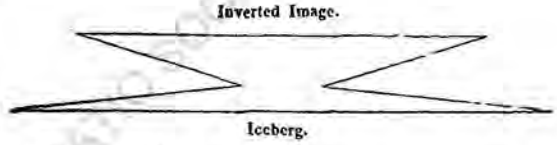
On the 21st and 22d, we sailed to the W.N.W. in an open sea; and, on the 23d, at noon, being in lat. 62° 43′ 09″, long. 61° 32′ 49″, we saw several icebergs, and some loose ice, to the north-westward. We obtained soundings

Tues. 22. Wed. 23.

* The ice here having a motion which was very perceptible in the artificial horizon, we had recourse to a mode of observing the meridian altitude, which we had occasionally adopted in the former voyage. Two observers brought the same limb of the sun down in separate horizons; the first of these taking care never to allow the two images to separate entirely, and the second never permitting them to overlap. The mean of the two observations being then taken, the error arising from the rolling motion of the ice may thus be in a great measure obviated, and the altitude obtained within the nearest minute.

1819. June. in the evening in two hundred fathoms, fine sandy bottom, being close to a large iceberg, from which copious streams of water were flowing on the side next the sun.

Thur. 24. On the clearing up of a fog, on the morning of the 24th, we saw a long chain of icebergs, extending several miles in a N.b.W. and S.b.E. direction; and, as we approached them, we found a quantity of "floe-ice" intermixed with them, beyond which, to the westward, nothing but ice could be seen. At noon being in lat. 63° 34′ 24″, long. 61° 34′ 28″, we had soundings, with one hundred and twenty fathoms of line, on a bottom of fine sand, which makes it probable that most of the icebergs were aground in this place. In the afternoon, we sailed within the edge of the ice, as much as a light westerly wind would admit, in order to approach the western land, as directed by my instructions. Some curious effects of atmospheric refraction were observed this evening, the low ice being at times considerably raised in the horizon, and constantly altering its appearance. An iceberg, at the distance of two or three miles from us, assumed an inverted shape, as in the following figure:



Frid. 25. The weather being nearly calm on the morning of the 25th, all the boats were kept a-head, to tow the ships through the ice to the westward. It remained tolerably open till four P.M., when a breeze, freshening up from the eastward, caused the ice through which we had lately been towing, to close together so rapidly, that we had scarcely time to hoist up the boats before the ships were immoveably "beset." The clear sea which we had left was about four miles to the eastward of us, while to the westward nothing but one extensive field of ice could be seen. It is impossible to conceive a more helpless situation than that of a ship thus beset, when all the power that can be applied will not alter the direction of her head a

Sat. 26. single degree of the compass. On the 26th, we were in lat. by observation, 63° 59′ 29″, and long. 61° 42′ 58″, having one hundred and twenty-five fathoms, on a fine sandy bottom. The deep-sea line indicated a drift to the S.b.W. Some of our gentlemen, having walked a mile or two from the ships, imagined that they saw the marks of a sledge upon the ice, but, as

no traces either of dogs or of one human foot appeared, they were perhaps mistaken. 1819. June.

The observations made here on the dip and variation of the magnetic needle, and on the intensity of the magnetic force, as well as the result of a number of lunar distances, obtained on this and the two following days, while thus beset, will be found in the Appendix. The wind increased to a strong gale from the northward, which continued the whole of the following day; when we found by observation that the ships had drifted Sun. 27. S. 23° W., thirteen miles and a quarter, the soundings having decreased to one hundred and twenty fathoms.

A large black whale, *(Balæna Mysticetus,)* being the first, was seen near the ships. It is usual for these animals to descend head-foremost, displaying the broad fork of their enormous tail above the surface of the water; but, on this occasion, the ice was so close as not to admit of this mode of descent, and the fish went down tail-foremost, to the great amusement of our Greenland sailors.

As long as the wind continued to blow strong towards the ice, so as to keep it close, the ships lay securely sheltered from the sea; but at nine in the evening, when it veered a little to the westward, the ice became more slack, and we began to feel the effects of the swell which was thus admitted from without: each roll of the sea forced the heavy masses of ice against the rudder and counter with such violence as would have greatly endangered a ship built in the ordinary way; strengthened as ours were, however, they escaped without damage. Frequent endeavours were made to heave the heads of the ships round, in order that they might receive the heaviest pressure on their bows, but every attempt proved unsuccessful, and we remained in the same unpleasant situation during the whole of the 28th. Mon. 28.

While in this state, a large white bear came near the Griper, and was killed by her people, but he sunk between the pieces of ice. This animal had, probably, been attracted by the smell of some red herrings which the men were frying at the time. It is a common practice with the Greenland sailors to take advantage of the strong sense of smelling which these creatures possess, by enticing them near the ships in this manner.

The swell had somewhat subsided on the 29th, but the ships remained Tues. 29. firmly fixed in the ice as before. In the course of the day we saw land bearing N. 69° W. about thirteen leagues distant, appearing from the mast-head like a group of islands, and situated near to the entrance of Cumber-

1819. June. Wed. 30. land Strait; the soundings were one hundred and thirty-five fathoms; the temperature of the sea at that depth 30°; that of the surface being the same; and of the air 34°. On the 30th, the ice began to slacken a little more about the ships; and, after two hours' heaving with a hawser on each bow brought to the capstan and windlass, we succeeded in moving the Hecla about her own length to the eastward, where alone any clear sea was visible. The ice continuing to open still more in the course of the day, we were at length enabled to get both ships into open water, after eight hours' incessant labour.

Our first attempt to approach the western coast having thus failed, I consulted the Greenland Masters, as to what were the most likely means to be adopted for effecting this object. Mr. Allison thought it would be advisable to run a degree or two back again to the southward; while Mr. Fife was of opinion, that it might be attempted, with better chance of success, about the latitude of Mount Raleigh, which forms one side of the narrowest part of Davis' Strait. I determined on the latter, as being more conformable to the tenor of my instructions; and a course was accordingly shaped close along the edge of the ice, which led us considerably to the eastward of north, in order to take advantage of any opening which might occur. On getting into clear water, we found that the rudders were much rubbed by the blows they had received while beset in the ice.

July, 1st & 2d. On the 1st and 2d of July, we continued to keep close to the edge of the ice without perceiving any opening in it. Its outer margin consisted of heavy detached masses, much washed by the sea, and formed what is technically called "a pack," this name being given to ice when so closely connected as not to admit the passage of a ship between the masses. Within the margin of the pack, it appeared to consist of heavy and extensive floes, having a bright ice-blink over them; but no clear water could be discovered to the westward. The birds, which had hitherto been seen since our first approach to the ice, were fulmar petrels, little auks, looms, *(Uria Brunnichii,)* and a few glaucous gulls, *(Larus Glaucus.)*

Sat. 3. On the morning of the 3d the wind blew strong from the eastward, with a short breaking sea and thick rainy weather, which made our situation for some hours rather an unpleasant one, the ice being close under our lee. Fortunately, however, we weathered it by stretching back a few miles to the southward. In the afternoon the wind moderated, and we tacked again to the northward, crossing the Arctic circle at four P.M., in the longitude of 57° 27′ W. We passed at least fifty icebergs in the course of the day, many

ASIATIC SOCIETY MUMBAI

Drawn & Engraved by W. Westall A.R.A. from a Sketch by Lieut.t Beechy.

Situation of H. M. S. Hecla & Griper

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

of them of large dimensions. At a quarter past five P.M., we sounded in one hundred and fifteen fathoms; the water at the surface of the sea had the same brownish tinge which has already been noticed, but no difference in its temperature or specific gravity could be detected. Towards midnight, the wind having shifted to the south-west, and moderated, another extensive chain of very large icebergs appeared to the northward: as we approached them the wind died away, and the ships' heads were kept to the northward, only by the steerage way given to them by a heavy southerly swell, which, dashing the loose ice with tremendous force against the bergs, sometimes raised a white spray over the latter to the height of more than one hundred feet, and being accompanied with a loud noise, exactly resembling the roar of distant thunder, presented a scene at once sublime and terrific. We could find no bottom near these icebergs with one hundred and ten fathoms of line. 1819. July.

At four A.M., on the 4th, we came to a quantity of loose ice, which lay straggling among the bergs; and, as there was a light breeze from the southward, and I was anxious to avoid, if possible, the necessity of going to the eastward, I pushed the Hecla into the ice, in the hope of being able to make our way through it. We had scarcely done so, however, before it fell calm; when the ship became perfectly unmanageable, and was for some time at the mercy of the swell, which drifted us fast towards the bergs. All the boats were immediately sent a-head to tow; and the Griper's signal was made, not to enter the ice. After two hours' hard pulling, we succeeded in getting the Hecla back again into clear water, and to a sufficient distance from the icebergs, which it is very dangerous to approach when there is any swell. At noon we were in lat. 66° 50′ 47″, long. 56° 47′ 56″, being near the middle of the narrowest part of Davis' Strait, which is here not more than fifty leagues across. Davis, on returning from his third voyage, sets it down at forty leagues*; and in another place remarks: "In the latitude of sixtie-seuen degrees, I might see America, west, from me, and Desolation, (Greenland), east†." The truth of this last remark had been much doubted, till the observations made on our expedition of 1818, by determining the geographical position of the two coasts thus seen by Davis, served to confirm the accuracy of that celebrated and able navigator. Sun. 4.

* Hakluyt's *Collection of Voyages.*

† *The Worlde's Hydrographicall Discription*, 1595.

1819. July. Mon. 5. On the 5th, it was necessary to pass through some heavy streams of ice, in order to avoid the loss of time by going round to the eastward. On this, as on many other occasions, the advantage possessed by a ship of considerable weight in the water, in separating the heavy masses of ice, was very apparent. In some of the streams, through which the Hecla passed, a vessel of a hundred tons less burthen must have been immoveably beset. The Griper was on this, and many other occasions, only enabled to follow the Hecla by taking advantage of the openings made by the latter.

Tues. 6. At noon, on the 6th, being in lat. 67° 11′ 05″, long. 57° 16′ 26″, we had soundings in one hundred and seventy-two fathoms, on a bottom of shining sand, mixed with small black specks. A number of looms were killed, which being very good to eat, were served to the officers and ship's company. A herd of sea-horses (*Trichecus Rosmarus*) being seen lying on a piece of ice, our boat succeeded in killing one of them. These animals usually lie huddled together, like pigs, one over the other, and are so stupidly tame, as to allow a boat to approach them, within a few yards, without moving. When, at length, they are disturbed, they dash into the water in great confusion. It may be worth remarking, as a proof how tenacious the walrus sometimes is of life, that the animal killed to-day struggled violently for ten minutes after it was struck, and towed the boat twenty or thirty yards, after which, the iron of the harpoon broke; and yet it was found, on examination, that the iron barb had penetrated both auricles of the heart. A quantity of the blubber was put into casks, as a winter's supply of lamp-oil.

Wed. 7. On the 7th, in standing to the northward, we came to a stream of ice, three quarters of a mile wide, which obstructed our passage in that direction. The wind died away as soon as we had entered the stream, and it required six hours' rowing in the boats to tow the ships into clear water beyond it. It is curious to observe, in passing under the lee of ice, however small its extent or height above the sea, an immediate decrease in the strength of the wind. This effect cannot be attributed to any degree of shelter afforded by the ice, as, in the cases to which I allude, it is, perhaps, not more than a single foot above the surface of the sea. At noon, being in lat., by observation, 68° 24′ 52″, and in long. 57° 00′ 43″, we obtained soundings in a hundred and seventy-five fathoms, on a bottom of greenish-coloured mud, into which the lead sunk several inches. At two P.M. a thermometer in the sun rose to 70°, the temperature of the shade being 44°, and the weather perfectly calm and cloudless. The card

commonly used in Walker's Azimuth Compass had traversed so sluggishly for some days past, that it was now found necessary to substitute a lighter one, supplied by the maker for this purpose. The looms and tern were numerous near the ice. 1819. July.

On the 8th, at noon, we observed, in lat. 68° 30′ 01″, and long. 57° 22′ 57″, being 6′ 51″ to the southward, and 9′ 53″ to the eastward of the dead reckoning. We sounded in a hundred and seventy-eight fathoms' water, the bottom being of the same nature as on the preceding day. Thurs. 8.

On the 9th, having reached the latitude of 68° 45′ 53″, long. 57° 49′ 51″, the ship was found to have made less northing by eleven miles and three quarters than the log gave. The soundings were a hundred and fifty-two fathoms, the lead being covered with soft green mud, mixed with sand and gravel. Frid. 9.

Large flocks of tern and looms were seen about the ice. A northerly wind prevented our making much progress, for the ice was still so compact in every part as to render it impossible to penetrate to the westward; and nothing, therefore, remained to be done but to make the best way we could, by beating to the northward along the edge of the pack.

On the 10th a thick fog came on, which made great caution necessary in sailing, there being a great many icebergs near us. There is, however, even in the thickest fog, a strong reflection of light from these immense bodies of ice, which, with an attentive look-out, is generally visible at a sufficient distance to enable the navigator, if in smooth water, to avoid coming in contact with them. Sat. 10.

At noon, the wind being still against us, we had only reached the lat. of 69° 04′ 28″, being 9′ 49″ to the southward of the dead reckoning. The long. by the chronometers, was 58° 10′ 30″, being 23′ 47″ to the eastward of the account in two days. We obtained soundings in a hundred and sixty-seven fathoms, on a bottom of green mud, with a little sand and gravel. At night the fog froze as it fell upon the rigging, making it difficult to work the ship among the ice.

A large bear *(Ursus Maritimus)* being seen on a piece of ice, near which we were passing this morning, a boat was despatched in pursuit, and our people succeeded in killing and towing it on board. As these animals sink immediately on being mortally wounded, some dexterity is requisite to secure them, by first throwing a rope over the neck, at which many of the Greenland seamen are remarkably expert. It is customary for the boats of the whalers to have two or three lines coiled in them, which not only gives them great stability, but, with good management, makes it difficult for a bear, when swimming, to put Sun. 11.

1819. July. his paw upon the gunwale, which they generally endeavour to do; whereas, with our boats, which are more light and crank, and therefore very easily heeled over, I have more than once seen a bear on the point of taking possession of them. Great caution should, therefore, be used under such circumstances in attacking these ferocious creatures. We have always found a boarding-pike the most useful weapon for this purpose. The lance used by the whalers will not easily penetrate the skin, and a musket-ball, except when very close, is scarcely more efficacious.

We sounded at noon in two hundred and two fathoms, being in lat. by account, 69° 24′ 40″, long. 58° 16′ 42″, without making any allowance for the current, which, for the three preceding days, appeared to have been setting the ships to the S.S.E., at the rate of from eight to thirteen miles per day.

In the afternoon, on the clearing up of the fog, we found ourselves so surrounded by ice, in every direction, that it became necessary to stretch to the eastward, to avoid the risk of being again beset, a circumstance which might have occasioned a serious loss of time. A great number of seals were seen as we sailed through the ice, but very seldom two together.

Mon. 12. The weather was again so thick on the 12th, that we could seldom see above three or four hundred yards. The sun being visible, however, Captain Sabine and myself left the ship, and ascended an iceberg, in order to obtain the meridian altitude, which gave us the lat. of 69° 12′ 43″, and which was 8′ 20″ to the southward of the dead reckoning, our longitude, by account, being 57° 46′ 13″. Streams of the purest water were flowing from this berg, a luxury not so often enjoyed by seamen in any other navigation, and which is, perhaps, of essential importance in the preservation of health, where scurvy is the disease most to be apprehended. The fog froze so hard upon the sails and rigging during the night, that I believe some tons were shaken off in the

Tues. 13. morning, to enable us to handle the ropes, and to work the ship with greater facility. The fields of ice and the icebergs must occasionally, during the summer, receive a considerable addition by this kind of deposit. Of the latter when the fog had cleared away for a short time in the evening, we counted no less than sixty-two of large dimensions, at no great distance from us, besides a number of smaller ones. We were, at noon, in lat. by account, 70° 06′ 32″, and in long. 57° 33′ 56″, having a hundred and forty-seven fathoms' water, on a muddy bottom.

Wed. 14. The weather continued so foggy on the 14th, that very little progress could be made. We caught some fine specimens of the *Clio Borealis*, called by the

sailors whales' food, and also of *Beroes*, which were very numerous near the surface of the water. 1819. July.

On the 15th, the fog being still as thick as before, our latitude, observed on an iceberg, was 70° 28′ 52″; while that observed on board by Lieut. Beechey, with Captain Kater's altitude-instrument, was 70° 27′ 43″, the difference according exactly with the bearing and distance of the iceberg from the ship. The longitude was 59° 11′ 58″, and the variation of the needle, as observed upon the ice, had increased to 79° 48′ westerly. Mr. Fisher made an experiment on the specific gravity of berg-ice. Having formed a piece of this ice into a cube, whose sides measured sixty-eight lines, he floated it in a tub of sea-water, of the specific gravity 1.0256, and at the temperature of 33°, when nine lines remained above the surface of the water, being nearly one-eighth. Thur. 15.

On the 16th, in running along the edge of the ice with a fresh breeze from the south-west, we passed the Brunswick, whaler, of Hull, beating to the southward. She crossed within hail of the Griper, and the master informed Lieutenant Liddon that he had, on the 11th, left a large fleet of fishing-ships about the latitude of 74°, unable to proceed farther to the northward. We had been stopped in a similar manner, and in the same place, on the voyage of 1818, which renders it not improbable, that, at this period of the year, the same obstruction will generally be found to occur about that latitude. The annual experience of the whalers has, indeed, long ago, made it evident, that the facility with which a ship may sail up Davis' Strait, depends entirely upon the season at which the attempt is made. For the first fortnight in June, it is seldom practicable to get much beyond the Island of Disko, or about the latitude of 69° to 70°. Towards the 20th of that month, the ships usually reach the great inlet, called North-East Bay; and, by the end of June, the ice allows them, though not without great exertion, to penetrate to the Three Islands of Baffin, which lie just beyond the seventy-fourth degree of latitude. From that time till about the end of August, the ice presents almost daily, less and less obstruction; so that, if the object be simply to sail as far north as possible into Baffin's Bay, without regard to the capture of whales, there is every reason to believe that a ship, entering Davis' Strait on the 1st of July, may sail into the latitude of 74° or 75°, without meeting with any detention on account of the ice, and, perhaps, without even seeing the land till she arrive in a high latitude. Frid. 16.

On the 17th, the margin of the ice, appearing more open than we had yet seen it, and there being some appearance of a "water-sky" to the north- Sat. 17.

1819. July. west, I was induced to run the ships into the ice, though the weather was too thick to allow us to see more than a mile or two in that direction. We were, at noon, in latitude 72° 00′ 21″, longitude 59° 46′ 18″, the depth of water being one hundred and ninety fathoms, on a muddy bottom. The wind shortly after died away, as usual, and, after making a number of tacks, in order to gain all we could to the westward, we found ourselves so closely hemmed in by the ice on every side, that there was no longer room to work the ships, and we therefore made them fast to a floe, till the weather should clear up. The afternoon was employed in taking on board a supply of water from the floe. It may be proper at once to remark that, from this time till the end of the voyage, snow-water was exclusively made use of on board the ships for every purpose. During the summer months, it is found in abundance in pools upon the floes and icebergs, and in the winter snow was dissolved in the coppers for our daily consumption. The fog cleared away in the evening, when we perceived that no further progress could be made through the ice, into which we had sailed to the westward about twelve miles. We were, therefore, once more under the necessity of returning to the eastward, lest a change of wind should beset the ships in their present situation. Previously, however, to our return, we made some observations, on the ice, for the variation and dip of the magnetic needle, the former of which was found to be 80° 55′ 27″ W., and the latter 81° 14′ 9″.

Sun. 18. A thick fog came on again at night, and prevailed till near noon on the 18th when we came to a close but narrow stream of ice, lying exactly across our course, and at right angles to the main body of the ice. As this stream extended to the eastward as far as we could see from the "crow's nest," an endeavour was made to push the ships with all sail through the narrowest part. The facility with which this operation, technically called "boring," is performed, depends chiefly on having a fresh and free wind, with which we were not favoured on this occasion; so that, when we had forced the ships about one hundred yards into the ice, their way was completely stopped. The stream consisted of such small pieces of ice, that when an attempt was made to warp the ships a-head by fastening lines to some of the heaviest masses near them, the ice itself came home, without the ships being moved forward. Every effort to extricate them from this helpless situation proved fruitless for more than two hours, when the Hecla was at length backed out, and succeeded in pushing through another part of the stream in which a small opening appeared just at that moment. All our boats were immediately

ASIATIC SOCIETY MUMBAI

Drawn & Engraved by W. Westall A.R.A. from a Sketch by Lieut.t Beechey.

Iceberg in Baffins Bay.
July 1819.

Published by John Murray London March 6 1821.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

despatched to the assistance of the Griper, which still remained beset, and which no effort could move in any direction. We at length resorted to the expedient of sending a whale-line to her from the Hecla, and then making all sail upon the latter ship, we succeeded in towing her out, head to wind, till she was enabled to proceed in clear water. The crossing of this stream of ice, of which the breadth scarcely exceeded three hundred yards, occupied us constantly for more than five hours and may serve as an example of the detention to which ships are liable in this kind of navigation. In the course of the afternoon, one of the Hecla's boats was upset by the ice, and Mr. Palmer, with all her crew, thrown out of her; but, by getting upon the ice, they fortunately escaped with no other injury than a thorough wetting. 1819. July.

The wind having veered to the northward, we tacked off and on, beating along the edge of the ice, in which no opening appeared, to encourage a hope of getting through it to the westward. At noon we had reached the lat. of 72° 31′ 58″, and long. 59° 03′ 54″, our soundings being one hundred and forty-two fathoms, on a muddy bottom. In the afternoon, a ship running to the southward, and which we supposed to be one of the homeward-bound whalers, passed us at the distance of seven miles. Mon. 19.

At noon, on the 20th, we were in lat., by account, 72° 57′ 31″, long. 58° 40′ 57″, and the depth of water was one hundred and twenty fathoms, the bottom consisting of mud, with small black stones. At this time, the weather being perfectly calm, with a thick fog, we perceived that a current, setting to the S.S.W., was drifting the ship towards a large iceberg in that direction; and a quantity of floe-ice, which was driving the same way, threatened to enclose us between it and the berg. All the boats were instantly lowered, and sent a-head to tow, by which means we cleared the berg, just one minute before the floe-ice came forcibly in contact with it, surrounding it on every side. This iceberg was about one hundred and forty feet high in one part, and from the soundings we obtained near it, must have been aground in one hundred and twenty fathoms, so that its whole height was about eight hundred and sixty feet. The weather continued so foggy during the rest of the day, that it required our utmost attention to keep clear of the numerous ice-bergs which lay in our way. Tues. 20.

Early on the morning of the 21st, the fog cleared away, and discovered to us the land called by Davis Hope Sanderson, and the Woman's Islands, being the first land we had seen in sailing northwards into Baffin's Bay, from Wed. 21.

1819. July. the lat. of 63¾°. We found ourselves in the midst of a great number of very high icebergs, of which I counted from the crow's nest, eighty-eight; besides many smaller ones. We tacked immediately to the westward, in order to take advantage of the only clear weather we had enjoyed for the last fourteen days, to examine the state of the ice, and observed at noon, in lat. 72° 58′ 13″, the long., by chronometers, being 58° 42′ 11″. The soundings were two hundred and twenty-eight fathoms, muddy-bottom; having deepened from one hundred and six, in sailing eight miles to the westward.

Having now reached the latitude of 73°, without seeing a single opening in the ice, and being unwilling to increase our distance from Sir James Lancaster's Sound, by proceeding much farther to the northward, I determined once more to enter the ice in this place, and to try the experiment of forcing our way through it, in order to get into the open sea, which the experience of the former voyage led me to believe we should find upon the western coast of Baffin's Bay. This determination was strengthened by the recollection of the serious obstructions we had met with the preceding year, in the neighbourhood of Prince Regent's Bay, where greater detention, as well as danger, had been experienced, than on any other part of that coast. Being now, therefore, favoured with clear weather, and a moderate breeze from the south-eastward, we ran into the ice, which, for the first two miles, consisted of detached pieces, but afterwards of floes of considerable extent, and six or seven feet in thickness. The wind died away towards midnight, and the weather was serene and clear. The altitude of the sun on the meridian below the pole, gave the latitude 72° 59′ 13″, being 11′ 57″ to the southward of that deduced from the observations of the preceding and following noons, which error may, perhaps, be attributed to the elevation of the horizon by terrestrial refraction. The temperature of the air at this time was 40°; of the water, 34°, and the barometer stood at 29.57 inches. A large bear was seen on one of the floes, and we passed the tracks of many others.

Thur. 22. On the 22d, the wind was light from the eastward, and we made very little progress. We had occasionally to heave the ships through with hawsers, between the heavy masses of ice, which became more and more close as we advanced, till, at length, towards the evening, we were fairly beset, there being no open water in sight from the mast-head in any quarter of the compass. Some hands were kept constantly employed in heaving

the ships through the ice, taking advantage of every occasional opening which presented itself, by which means we advanced a few hundred yards to the westward during the night. 1819. July.

At six, A.M., on the 23d, a thick fog came on, which rendered it impossible to see our way any further. Frid. 23. It often happens, in thick weather, that much distance is lost by ships taking a wrong "lead," as the channels between floes of ice are technically called; so that, on the weather clearing, it is discovered, when too late, that another opening, perhaps a few yards only from that through which they had sailed, would have conducted them into clear water. We, therefore, warped to an iceberg, to which the ships were made fast at noon, to wait the clearing up of the fog, being in lat. 73° 04′ 10″, long. 60° 09′ 07″. The soundings were one hundred and ninety-seven fathoms, on a muddy bottom, and the variation of the needle 82° 33′ 21″ westerly. Some observations on the intensity of the magnetic force, by Captain Sabine, will be found in the Appendix. At eight, P.M., the weather cleared up, and a few small pools of open water were seen here and there, but the ice was generally as close as before, and the wind being to the westward of north, it was not deemed advisable to move. When ships are thus beset, there is a great advantage in securing them to the largest body of ice that can be found, and particularly to the bergs, as they are by this means better enabled to retain their situation, the drift of the ice being generally less, in proportion to its depth under water. Another advantage in securing a ship to an iceberg is, that these bodies usually keep a small space of clear water under their lee, in consequence of the quicker drift of the floes and loose ice to leeward. It not unfrequently happens that a ship is thus dragged into clear water, as the sailors express it, that is, that the whole of the floe-ice is carried to leeward past the berg to which the ship is attached, leaving her at length in an open sea.

The ice appearing to open a little in the W.N.W., on the morning of the 24th, preparations were made for warping the ships in that direction, the wind being still to the westward of north, but the fog came on again so thick, that it was necessary still to remain at the berg. Sat. 24. At noon, by our observations, we were in lat. 72° 59′ 50″, long. 60° 07′ 54″, making a drift of four miles and two-thirds in twenty-four hours, in a S. 1° E. direction. The soundings had deepened to two hundred and sixty-five fathoms, the bottom being light-green mud. The afternoon was occupied in obtaining

1819. July. azimuths on board the Hecla, with her head on different points of the compass, in order to ascertain the amount of the irregularities of the magnetic needle produced by local attraction. These observations will be found in the Appendix, and by comparison with those previously made at Northfleet, will serve to shew in what degree the irregularities alluded to had increased with the increase of dip, and with the consequent diminution in the directive power of the earth's magnetism upon the needle.

Sun. 25. The weather being clear on the morning of the 25th, and a few narrow lanes of water appearing to the westward, the Griper was made fast astern of the Hecla; and her crew being sent to assist in manning our capstan, we proceeded to warp the ships through the ice. This method, which is often adopted by our whalers, has the obvious advantage of applying the whole united force in separating the masses of ice which lie in the way of the first ship, allowing the second, or even third, to follow close astern, with very little obstruction. In this manner we had advanced about four miles to the westward, by eight P.M., after eleven hours of very laborious exertion; and having then come to the end of the clear water, and the weather being again foggy, the ships were secured in a deep "bight," or bay in a floe, called by the sailors a "natural dock." An extra allowance of meat and spirits was served to the ship's companies, and all hands were permitted to go to rest till the state of the weather and of the ice should become more favourable.

Mon. 26. Early on the morning of the 26th, there was clear water as far as we could see to the westward, which on account of the fog, did not exceed the distance of three hundred yards. We made sail, however, and having groped our way for about half a mile, found the ice once more close in every direction, except that in which we had been sailing, obliging us to make the ships fast to a floe. I sent a boat away to endeavour to find a lane of clear water leading to the westward. She returned on board in an hour, without success, having with difficulty found her way to the ship, by our musquets, and other signals. The latitude here, by observation, was 73° 02′ 17″, long., by chronometers, 60° 11′ 52″, by which the drift of the ice in the last twenty-four hours appears to have been N. 1° E., five miles and three quarters, or in a direction nearly opposite to that of the wind. The soundings were two hundred and eight fathoms, on a muddy bottom. At half-past three, P.M., the weather cleared up, and a few narrow lanes of water being seen to the westward, every exertion was immediately made to get into them. On beginning to heave, however, we found that the

" hole" of water, in which the Hecla lay, was now so completely enclosed by ice, that no passage out of it could be found. We tried every corner, but to no purpose; all the power we could apply being insufficient to move the heavy masses of ice which had fixed themselves firmly between us and the lanes of water without. In the mean time, Lieutenant Liddon had succeeded in advancing about three hundred yards, and had placed the Griper's bow between two heavy floes, which it was necessary to separate before any further progress could be made. Both ships continued to heave at their hawsers occasionally, as the ice appeared to slacken a little, by which means they were now and then drawn a-head a few inches at a time, but did not advance more than half-a-dozen yards in the course of the night. By our nearing several bergs to the northward, the ice appeared to be drifting in that direction, the wind being moderate from the southward. 1819. July.

About three A.M., by a sudden motion of the ice, we succeeded in getting the Hecla out of her confined situation, and ran her up astern of the Griper. The clear water had made so much to the westward, that a narrow neck of ice was all that was now interposed between the ships and a large open space in that quarter. Both ships' companies were, therefore, ordered upon the ice to saw off the neck, when the floes suddenly opened sufficiently to allow the Griper to push through under all sail. No time was lost in the attempt to get the Hecla through after her, but, by one of those accidents to which this navigation is liable, and which renders it so precarious and uncertain, a piece of loose ice which lay between the two ships, was drawn after the Griper by the eddy produced by her motion, and completely blocked the narrow passage through which we were about to follow. Before we could remove this obstruction by hauling it back out of the channel, the floes were again pressed together, wedging it firmly and immoveably betwixt them; the saws were immediately set to work, and used with great effect, but it was not till eleven o'clock that we succeeded, after seven hours' labour, in getting the Hecla into the lanes of clear water which opened more and more to the westward. Our latitude, by account at noon, was 73° 05′ 56″, the longitude 60° 24′ 27″. Tues. 27.

Being now favoured with a fresh breeze from the S.E.b.S., we made considerable progress, though on a very crooked course, to the northward and westward. In one respect the character of the ice was here altered, as we found a great many floes of "young" or "bay" ice, which had probably been newly formed in the sheltered situations afforded by the larger floes.

1819. July. To avoid the necessity of going round, or where no other channel presented itself, we ran through several of these bay-floes, which were from four to six inches thick, ploughing up the ice before the ship's stem, at the rate of five miles an hour. If they were not very broad, the Hecla did not lose her way in passing through them. Frequently, however, she was stopped in the middle, which made it necessary to saw and break the ice a-head, till she made another start, and, having run a short distance in clear water, was again imbedded in the same manner. We passed one field of ice, about ten feet in thickness, and many miles in length, as we could not see over it from the mast-head. This was the only "field," according to the definition applied to that term by the whalers, that I had ever seen in Baffin's Bay. About eleven P.M. the lanes of open water a-head became very contracted, and at half-past eleven, in endeavouring to force through a floe, under a heavy press of canvass, the Hecla was completely wedged in, having run her own length into it, though its thickness was between a foot and eighteen inches. In the course of this day's sailing, the ships received many severe blows from the ice, but apparently suffered no damage. The concussions which the chronometers experienced, were, perhaps, such as few watches of this kind had ever before been exposed to; but we did not subsequently discover that any alteration had taken place in their rates, in consequence of them.

Wed. 28. The wind continued to blow strong from the south-east with heavy-rain; and at half-past three A.M., after several hours' sawing, in which the men suffered much from wet and fatigue, we succeeded in getting clear; but after running a quarter of a mile, were again beset in the same manner. By the time the Griper had joined us, we had once more unavoidably hampered the Hecla among the ice, and did not succeed in extricating her till four P.M., after which we found so much clear water as we proceeded, that, with the exception of a few streams and "patches," which we met with on the following day, and through which the ships sailed without much difficulty, we had now passed every impediment which obstructed our passage to Sir James Lancaster's Sound. The breadth of this barrier of ice, which occupies the middle of Baffin's Bay, and which had never before been crossed in this latitude at the same season, was eighty miles, in a N. 63° W. direction. I have been thus particular and minute, perhaps tediously so, in detailing our endeavours to obtain a passage through the ice to the western coast of Baffin's Bay, in order to shew how necessary it is to persevere and not to be discouraged by frequent failures, nor deterred from

entering the ice by the apprehension of being beset. By taking advantage of every little opening that is afforded, I believe that a strong-built vessel of proper size and weight may, in most seasons, be pushed through this barrier which occupies the centre part of Baffin's Bay, about this parallel of latitude. It must, at the same time, be confessed, that, had we not been favoured with strong south-easterly winds, it would probably have required several days longer to effect this passage. 1819. July.

On the 29th, we had so much clear water, that the ships had a very perceptible pitching motion, which, from the closeness of the ice, does not very often occur in the Polar regions, and which is, therefore, hailed with pleasure, as an indication of an open sea. At noon we had reached, by the dead reckoning, the latitude of 73° 51′ 17″, and longitude 67° 47′ 51″, and we could find no bottom with three hundred and ten fathoms of line. At five P. M. the swell increased considerably, and, as the wind freshened up from the north-east, the ice gradually disappeared; so that by six o'clock we were sailing in an open sea, perfectly free from obstruction of any kind. During the time we had been beset among the ice, the temperature of the air, in the shade, had varied from 28° to 38°, except in very clear and calm weather, when the thermometer had occasionally risen to 42°. The temperature of the water had been almost uniformly from 31° to 33°, but soon after our leaving the ice this evening, it increased to 37°, which temperature continued for a run of sixty-three miles to the westward, and then fell to 32° and 33°, till we had entered Sir James Lancaster's Sound. Thur. 29.

At four A. M. on the 30th, two or three ice-bergs were in sight, being the first we had seen since leaving the ice to the eastward. It is probable that these, together with some streams of ice which occurred in the afternoon, produced the diminution in the temperature of the sea, to which I have alluded above, and which took place soon after noon on this day. The Griper detaining us considerably, and the sea being now sufficiently open to allow us to take her in tow, we hove-to at nine A. M. for that purpose. Frid. 30.

We now seemed all at once to have got into the head-quarters of the whales. They were so numerous that I directed the number to be counted during each watch, and no less than eighty-two are mentioned in this day's log. Mr. Allison, the Greenland master, considered them generally as large ones, and remarked, that a fleet of whalers might easily have obtained a cargo here in a few days. It is, I believe, a common idea among the Greenland fishermen, that the presence of ice is necessary to ensure the

1819. July. finding of whales; but we had no ice in sight to-day, when they were most numerous. At noon we observed, in lat. 74° 01′ 57″, being the first meridian altitude we had obtained for four days, and differing from the dead reckoning only two miles, which is remarkable, considering the sluggishness of the compasses, and would seem to afford a presumptive proof that no southerly current exists in this part of Baffin's Bay. The longitude, by chronometers, was 75° 02′ 14″. In the afternoon the wind broke us off from the N. N. W., which obliged us to cast off the Griper, and we carried all sail a-head to make the land. We saw it at half-past five P. M., being the high land about Possession Bay, and at the same time several streams of loose but heavy ice came in sight, which a fresh breeze was drifting fast to the south-eastward. Sir James Lancaster's Sound was now open to the westward of us, and the experience of our former voyage had given us reason to believe that the two best months in the year for the navigation of these seas were yet to come. This consideration, together with the magnificent view of the lofty Byam Martin mountains, which forcibly recalled to our minds the events of the preceding year, could not fail to animate us with expectation and hope. If any proof were wanting of the value of local knowledge in the navigation of the Polar Seas, it would be amply furnished by the fact of our having now reached the entrance of Sir James Lancaster's Sound just one month earlier than we had done in 1818, although we had then sailed above a fortnight sooner, with the same general object in view, namely, to penetrate to the western coast of Baffin's Bay, where alone the North-west Passage was to be sought for. This difference is to be attributed entirely to the confidence which I felt, from the experience gained on the former voyage, that an open sea would be found to the westward of the barrier of ice which occupies the middle of Baffin's Bay. Without that confidence, it would have been little better than madness to have attempted a passage through so compact a body of ice, when no indication of a clear sea appeared beyond it.

The Hecla's cables were bent, and the Griper's signal made to do the same. As we approached the land, the wind drew directly out of the sound, which is commonly found to be the case in inlets of this nature, in which the wind generally blows directly up or down. A flock of white ducks, believed to be male eider-ducks, were seen in the afternoon, flying to the eastward.

Sat. 31. The wind increased to a fresh breeze on the morning of the 31st, which prevented our making much way to the westward. We stood in towards Cape Byam Martin, and sounded in eighty fathoms on a rocky bottom, at the distance

of two miles in an east direction from it. We soon after discovered the flag-staff which had been erected on Possession Mount on the former expedition; an object which, though insignificant in itself, called up every person immediately on deck to look at and to greet it as an old acquaintance. The Griper being considerably astern, I thought it a good opportunity to go on shore, in order to make some observations, while she was coming up. Captain Sabine and myself, therefore, left the ship, and landed in the same spot, near the mouth of the stream in Possession Bay, where observations had been made the preceding year. We found so much surf on the beach as to make it necessary to haul the boat up, to prevent her being stove. A number of loose pieces of ice had been thrown up above the ordinary high-water mark; some of these were so covered by the sand which the sea had washed over them, that we were at a loss to know what they were, till a quantity of it had been removed. From the situation and appearance of these masses, it occurred to some of us that similar masses, found under ground in those spots called *Kaltusæ*, in the islands near the coast of Siberia, might thus have been originally deposited. 1819. July.

The land immediately at the back of Possession Bay rises in a gentle slope from the sea, presenting an open and extensive space of low ground, flanked by hills to the north and south. In this valley, and even on the hills, to the height of six or seven hundred feet above the sea, there was scarcely any snow, but the mountains at the back were completely covered with it. The bed of the stream which winds along the valley is in many places several hundred yards wide, and in some parts from thirty to forty feet deep; but the quantity of water which it contained at this season was extremely small in proportion to the width between the banks, not exceeding forty feet on an average, and from one to three feet only in depth near the mouth of the stream. This feature is common in every part of the Polar regions in which we have landed; the beds, or ravines, being probably formed by the annual dissolution of the snow during a long series of years. Some pieces of birch-bark having been picked up in the bed of this stream, in 1818, which gave reason to suppose that wood might be found growing in the interior, I directed Mr. Fisher to walk up it, accompanied by a small party, and to occupy an hour or two, while the Griper was coming up, and Captain Sabine and myself were employed upon the beach, in examining the nature and productions of the country.

Mr. Fisher reported, on his return, that he had followed the stream between

1819. July. three and four miles, where it turned to the south-west, without discovering any indications of a wooded country; but a sufficient explanation respecting the birch-bark was, perhaps, furnished by his finding, at the distance of a quarter of a mile from the sea, a piece of whalebone two feet ten inches in length, and two inches in breadth, having a number of circular holes very neatly and regularly perforated along one of its edges, and which had undoubtedly formed part of an Esquimaux sledge. This circumstance affording a proof of the Esquimaux having visited this part of the coast at no very distant period, it was concluded that the piece of bark, above alluded to, had been brought hither by these people. From the appearance of the whalebone, it might have been lying there for four or five years. That none of the Esquimaux tribe had visited this part of the coast since we landed there in 1818, was evident from the flag-staff then erected still remaining untouched. Mr. Fisher found every part of the valley quite free from snow as high as he ascended it; and the following fact seems to render it probable that no great quantity either of snow or sleet had fallen here since our last visit. Mr. Fisher had not proceeded far, till, to his great surprise, he encountered the tracks of human feet upon the banks of the stream, which appeared so fresh, that he at first imagined them to have been recently made by some natives, but which, on examination, were distinctly ascertained to be the marks of our own shoes made eleven months before.

The only animals we met with were a fox, a raven, *(Corvus Corax,)* some ring-plovers, *(Charadrius Hiaticula,)* snow-buntings, and a wild bee, *(Apis Alpina.)* Several tracks of bears and of a cloven-footed animal, probably the rein-deer, were also observed upon the moist ground. Three black whales were seen in the bay, and the crown-bones of several others were lying near the beach. Considerable tufts of moss and of grass occur in this valley, principally in those parts which are calculated to retain the water produced by the melting of the snow. Indeed, moisture alone seems necessary to the growth of a variety of plants which are found in this dreary climate, and of which a detailed account will be given in the Appendix. Mr. Fisher, who had an opportunity of examining some of the fixed rocks, considered them to consist principally of basalt. A great quantity of limestone was found in the valley, together with pieces of granite, quartz, feldspar, trap, and sandstone.

The latitude observed at the mouth of the stream was 73° 31′ 16″, and the longitude by the chronometers, 77° 22′ 21″, the latter differing only 1′ 30″ to

the eastward of that obtained on the same spot, by No. 509 of Earnshaw, the preceding year. The dip of the needle was 86° 03′ 42″, and the variation 108° 46′ 35″, westerly, agreeing nearly with that observed by Lieutenant Hoppner, in 1818. At half-past ten A.M., when we landed, the tide was falling by the shore, and continued to do so till about half an hour before noon; the surf on the beach, however, did not allow me to determine the time with very great precision. By the mean of our observations made now, and in the foregoing year, the time of high water on full and change days, would appear to be about a quarter past eleven. At two P.M., the water had risen two feet and a half, and the whole rise of tide, as nearly as we could judge from the marks on the beach, may be from six to eight feet. The stream certainly came from the northward and westward along the shore of the bay, during the time that the tide was rising; and Lieut. Beechey observed, that, in running along shore, in a south-easterly direction, the ship seemed to go much faster by the land than she sailed through the water. It is more than probable, therefore, that the flood comes from the north-westward on this particular part of the coast. Near the spot on which we made the observations, a bottle was buried containing an account of our visit, and a pile of stones and earth raised over it. 1819. July.

In approaching Possession Bay, the colour of the water was observed to change to a light green, at the distance of two or two and a half miles from the shore, but there was no other appearance of shoal water, and we could find no bottom with sixty and seventy fathoms of line, well within it; we had fourteen fathoms, on a sandy bottom, at a cable's length from the beach.

Having finished our observations, we returned on board, and made all sail for the Sound; but the wind blowing still from the westward, the progress of the ships was but slow in that direction. The sea was perfectly free from ice, except a single berg, and one or two narrow though heavy streams, which offered, however, little or no obstruction to the navigation.

Annexed is an abstract of the Meteorological Journal for the month of July.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, at Sea, during the Month of *July*, 1819.

Day	Temperature of Air in shade.			Sea Water at the surface.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Temperature.	Specific Gravity.	Temperature when weighed.	Maximum.	Minimum.	Mean.		
	+ °	+ °	+ °			°	inches.	inches.	inches.		
1	30	34	36.33	33.2	1.0260	53	29.83	29.78	29.800	W.S.W.	Moderate breezes and fine.
2	37.5	35.5	36.25	33.3	1.0260	53	29.78	29.70	29.753	S.W.	Ditto
3	35	30	33.33	31.5	1.0260	53	29.61	29.10	29.302	S.E.	Moderate and cloudy. Snow and rain at times.
4	33	30.5	31.58	30	1.0261	54	29.42	29.35	29.387	Calm	Occasional light airs from the northward. Foggy weather.
5	33	29	30.83	30.8	1.0260	54	29.48	29.35	29.403	West	Light breezes and hazy.
6	38	31	34.42	33.1	1.0253	57	29.54	29.42	29.505	S.W.	Light breezes and fine.
7	46	34	39.83	35.8	1.0257	57	29.59	29.51	29.550	A.M. S.S.E. / P.M. Calm	Light airs and fine. Fine weather.
8	40	34	37.75	37.2	1.0260	57	29.68	29.60	29.629	North	Light airs and cloudy.
9	34	30	32.25	32.7	1.0254	54	29.74	29.69	29.721	N.N.E.	Light airs and cloudy, with snow.
10	32	28	30.00	31.5	1.0252	53.5	29.80	29.75	29.787	N.N.W.	Light breezes and foggy
11	32	26	29.50	30.8	1.0256	54	29.77	29.73	29.761	N.W.	Ditto.
12	33.5	28	30.50	32.1	1.0252	54	29.66	29.63	29.637	N.N.W.	Moderate breezes and foggy.
13	32	31	31.67	33.2	1.0256	55	29.90	29.72	29.829	A.M. N.N.W. / P.M. Westerly.	Light breezes and foggy.
14	36.5	28.5	32.83	34.2	1.0256	55	29.90	29.84	29.878	S.S.E.	Ditto
15	31	28	29.83	32.5	1.0250	53.5	29.91	29.81	29.875	N.b.W.	Light breezes and hazy.
16	36	27	33.00	34.2	1.0255	59	29.90	29.76	29.852	S.S.E.	Light breezes and cloudy.
17	34	31	33.50	32.8	1.0247	58	29.84	29.71	29.783	West	Light breezes and foggy, with rain.
18	33	30.5	32.00	32.1	1.0247	56	29.90	29.79	29.827	A.M. S.W. / P.M. N.N.E.	Light breezes and foggy, with snow.
19	34	29	31.00	33	1.0247	56	29.93	29.90	29.912	North	Light breezes and foggy, with small snow.
20	30	27	28.50	32.2	1.0250	56	29.84	29.70	29.791	N.N.W.	Light breezes and foggy.
21	42	27	37.67	33.8	1.0243	58	29.63	29.56	29.588	From north round by east to S.E.bE.	Light airs; occasional calms.
22	45	34	39.75	33	1.0183	58	29.62	29.58	29.605	East	Light airs and fine clear weather.
23	36	29	31.50	31.1	1.0252	55	29.70	29.62	29.665	N.W.b.W.	Light breezes and foggy.
24	37	31	33.75	31.4	. . .	. . .	29.83	29.60	29.759	N.N.W.	Light airs and foggy.
25	40	32	35.42	31.9	. . .	. . .	29.89	29.84	29.870	Westerly.	Light breezes and fine clear weather
26	35	28	32.33	31.9	1.0185	59	29.85	29.82	29.838	S.b	Light breezes and foggy weather.
27	36	33	33.75	32.0	. . .	. . .	29.90	29.74	29.842	S.E. b.E.	Moderate breezes and hazy weather.
28	33	33	33.00	31.7	1.0210	59	29.71	29.53	29.615	S.E. b.S.	Fresh breezes and hazy, with continued heavy rain.
29	37	33	34.25	33.1	1.0242	59	29.52	29.49	29.507	East	Fresh breezes and foggy, with rain at times.
30	38	33	36.25	34.8	1.0255	53	29.54	29.51	29.525	N.N.W.	Fresh breezes and fine.
31	43	35	37.08	32.6	1.0250	55	29.51	29.50	29.505	N.W.b.W.	Ditto.
	46	26	33.54	32.68			29.93	29.10	29.687		

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY OF MUMBAI

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

CHAPTER II.

ENTRANCE INTO SIR JAMES LANCASTER'S SOUND OF BAFFIN—UNINTERRUPTED PASSAGE TO THE WESTWARD—DISCOVERY AND EXAMINATION OF PRINCE REGENT'S INLET—PROGRESS TO THE SOUTHWARD STOPPED BY ICE—RETURN TO THE NORTHWARD—PASS BARROW'S STRAIT, AND ENTER THE POLAR SEA.

1819. August. Sun. 1.

WE were now about to enter and to explore that great sound or inlet which has obtained a degree of celebrity beyond what it might otherwise have been considered to possess, from the very opposite opinions which have been held with regard to it. To us it was peculiarly interesting, as being the point to which our instructions more particularly directed our attention; and, I may add, what I believe we all felt, it was that point of the voyage which was to determine the success or failure of the expedition, according as one or other of the opposite opinions alluded to should be corroborated. It will readily be conceived, then, how great our anxiety was for a change of the westerly wind and swell, which, on the 1st of August, set down Sir James Lancaster's Sound, and prevented our making much progress. We experienced also another source of anxiety. The relative sailing qualities of the two ships were found to have altered so much, that we were obliged to keep the Hecla under easy sail the whole day, to allow the Griper to keep up with us, although the latter had hitherto kept way with her consort, when sailing by the wind. The ships stretched to the northward across the entrance of the sound, meeting occasionally with some loose and heavy streams of ice, and were at noon in latitude, by observation, 73° 55′ 18″, and in longitude, by the chronometers, 77° 40′. Several whales were seen in the course of the day, and Mr. Allison remarked, that this was the only part of Baffin's Bay in which he had ever seen young whales; for it is a matter of surprise to the whalers in general, that they

1819. August. seldom or never meet with young ones on this fishery, as they are accustomed to do in the seas of Spitzbergen.

The Griper continued to detain us so much that I determined on making the best of our way to the westward, that no more time than was necessary might be occupied in the examination of the bottom of Sir James Lancaster's Sound, provided it should be found to be an inlet surrounded by land. I was the more inclined to do this, from the circumstance of the sea being so clear of ice, as to offer no impediment to the navigation, which rendered it next to impossible that the two ships should not meet each other again; and it seemed to me to be of considerable importance to obtain as early information as possible whether a passage did or did not exist there, as, in the latter event, we should have to proceed still further to the northward in search of one through some of the other sounds of Baffin; besides, the farther north we had to go, the shorter would the navigable season be to allow us to explore these sounds. On these considerations I ordered the Hecla to be hove to in the evening, and sent Lieutenant Liddon an instruction, with some signals, which might facilitate our meeting in case of fog: and I appointed as a place of rendezvous the meridian of 85° west, and as near the middle of the Sound as circumstances would permit. As soon, therefore, as the boat returned from the Griper, we carried a press of sail, and, in the course of the evening, saw the northern shore of the Sound looming through the clouds which hung over it.

Mon. 2. It fell calm on the morning of the 2d, and at nine A.M., we sounded with the deep-sea clamms, and found one thousand and fifty fathoms by the line, on a bottom of mud and small stones; but I believe the depth of water did not exceed eight or nine hundred fathoms, the ship's drift being considerable on account of the swell. It should be remarked, also, that where the soundings exceed five or six hundred fathoms, even in very calm weather, the actual depth must, in the usual way of obtaining it, be a matter of some uncertainty, for the weight of the line causes it to run out with a velocity not perceptibly diminished, long after the lead or the clamms have struck the ground. The clamms being now down, we were about to try the set of the current, by mooring a boat to the line, when the breeze again sprung up from the westward and prevented it. At noon we were in latitude by observation, 74° 30′ 03″., and in longitude 78° 01′., Cape Osborn bearing N. 79° W. distant forty-one miles.

The weather being clear in the evening, we had the first distinct view of

ASIATIC SOCIETY MUMBAI

Cape Bathurst. — Cape Bryam Martin S. 11° E.

Possession Bay. — Cape Fanshawe N. 86° W.

Land to the Westward of Hopes Monument.

F. W. Beechey del. — I. Clark

Hopes Monument N. 10° W.

both sides of the Sound, and the difference in the character of the two shores was very apparent, that on the south consisting of high and peaked mountains, completely snow-clad, except on the lower parts, while the northern coast, has generally a smoother outline, and had comparatively with the other, little snow upon it; the difference in this last respect, appearing to depend principally on the difference in their absolute height. The sea was open before us, free from ice or land; and the Hecla pitched so much from the westerly swell in the course of the day, as to throw the water once or twice into the stern windows, a circumstance which, together with other appearances, we were willing to attribute to an open sea in the desired direction. More than forty black whales were seen during the day. 1819. August.

We had alternately fresh breezes from the westward, and calms on the morning of the 3d, when we had only gained eight or nine miles upon the Griper, which we observed coming up the Sound before an easterly wind, with all her studding sails set, while we had a fresh breeze from the westward. In the fore-noon we were between Capes Warrender and Osborn, and had a good view of Sir George Hope's Monument, which proved to be a dark-looking and conspicuous hill on the main land, and not an island, as it appeared to be when at a distance, on our former voyage. Tues. 3.

A solitary iceberg being near us, Captain Sabine, Lieutenant Beechey, and Mr. Hooper, were sent upon it to observe the variation of the needle and the longitude, and to take angles for the survey, a base being measured by Massey's log between the ship and the berg. We here obtained soundings in three hundred and seventy-three fathoms, the bottom consisting of mud and small stones, of which a small quantity was brought up in the clamms. By a boat moored to this instrument, a tide or current was found to set north 65° E., at the rate of seven-eighths of a mile per hour; the variation observed upon the iceberg was 106° 58′ 05″ westerly. At noon, we were in latitude 74° 25′ 31″, long. 80° 04′ 30″.

Being favoured at length by the easterly breeze which was bringing up the Griper, and for which we had long been looking with much impatience, a crowd of sail was set to carry us with all rapidity to the westward. It is more easy to imagine than to describe the almost breathless anxiety which was now visible in every countenance, while, as the breeze increased to a fresh gale, we ran quickly up the sound. The mast-heads were crowded by the officers and men during the whole afternoon; and an unconcerned observer, if any could have been unconcerned on such an occasion, would have been amused by the

1819. August. eagerness with which the various reports from the crow's nest were received, all, however, hitherto favourable to our most sanguine hopes.

Between four and six P. M., we passed several riplings on the water, as if occasioned by a weather tide, but no bottom could be found with the hand leads. Being now abreast of Cape Castlereagh, more distant land was seen to open out to the westward of it, and between the cape and this land was perceived an inlet, to which I have given the name of the Navy Board's Inlet. We saw points of land apparently all round this inlet, but being at a very great distance from it we were unable to determine whether it was continuous or not. But as the land on the western side appeared so much lower and smoother than that on the opposite side near Cape Castlereagh, and came down, so near the horizon, about the centre of the inlet, the general impression was, that it is not continuous in that part. As our business lay to the westward, however, and not to the south, the whole of this extensive inlet was, in a few hours, lost in distance.

In the mean time the land had opened out, on the opposite shore, to the northward and westward of Cape Warrender, consisting of high mountains, and in some parts of table land. Several head-lands were here distinctly made out, of which the northernmost and most conspicuous, was named after Captain Nicholas Lechmere Pateshall, of the Royal Navy. The extensive bay into which Cape Pateshall extends, and which, at the distance we passed it, appeared to be broken, or detached in many parts, was named Croker's Bay in honour of Mr. Croker, Secretary of the Admiralty; I have called this large opening a bay, though the quickness with which we sailed past it did not allow us to determine the absolute continuity of land round the bottom of it; it is, therefore, by no means improbable, that a passage may here be one day found from Sir James Lancaster's Sound into the Northern Sea. The Cape, which lies on the western side of Croker's Bay, was named after Sir Everard Home.

Our course was nearly due west, and the wind still continuing to freshen, took us in a few hours nearly out of sight of the Griper. The only ice which we met with consisted of a few large bergs very much washed by the sea; and, the weather being remarkably clear, so as to enable us to run with perfect safety, we were, by midnight, in a great measure relieved from our anxiety respecting the supposed continuity of land at the bottom of this magnificent inlet, having reached the longitude of 83° 12′, where the two shores are still above thirteen leagues apart, without the slightest appear-

Cape Warrender, bearing N. 82° W.

Continuation of the North Shore of Sir James Lancaster's Sound, to the Eastward of C. Warrender.

North Shore of Barrow's Strait, bearing North.

Continuation of the above.

F. W. Beechey del.

I. Clark sculp.

ASIATIC SOCIETY MUMBAI

ance of any land to the westward of us for four or five points of the compass. The colour of the water having become rather lighter, we hove-to at this time for the Griper, and obtained soundings in one hundred and fifty fathoms on a muddy bottom. The wind increased so much as to make it necessary to close-reef the sails, and to get the top-gallant yards down, and there was a breaking sea from the eastward. A great number of whales were seen in the course of this day's run. 1819. August.

Having made the ship snug, so as to be in readiness to round to, should the land be seen a-head, and the Griper having come up within a few miles of us, we again bore up at one A.M. At half-past three, Lieutenant Beechey, who had relieved me on deck, discovered from the crow's-nest, a reef of rocks, in-shore of us to the northward, on which the sea was breaking. These breakers appeared to lie directly off a cape, which we named after Rear-Admiral Joseph Bullen, and which lies immediately to the eastward of an inlet, that I named Brooking Cuming Inlet. As the sea had now become high, and the water appeared discoloured at some distance without the breakers, the Hecla was immediately rounded to, for the purpose of sounding; we could find no bottom with fifty fathoms of line, but the Griper coming up shortly after, obtained soundings in seventy-five fathoms, on a bottom of sand and mud. We here met with innumerable loose masses of ice, upon which the sea was constantly breaking, in a manner so much resembling the breakers on shoals, as to make it a matter of some little uncertainty at the time, whether those of which I have spoken above, might not also have been caused by ice. It is possible, therefore, that shoal water may not be found to exist in this place; but I thought it right to mark the spot on the chart to warn future navigators when approaching this part of the coast. That there is something out of the common way in this neighbourhood, appears, however, more than probable, from the soundings obtained by the Griper, which are much less than we found them in any other part of the Sound at the same distance from land. Wed. 4.

At seven A.M., there being less sea, and no appearance of broken or discoloured water, we again bore away to the westward, the Griper having joined us about the meridian of 85°, which had been appointed as our place of rendezvous. Since the preceding evening, a thick haze had been hanging over the horizon to the southward, which prevented our seeing the land in that direction, to the westward of 87°, while the whole of the northern shore, though, as it afterwards proved, at a greater distance from us, was distinctly

1819. August. visible. At noon, being in latitude 74° 15′ 53″ N., longitude, by chronometers, 86° 30′ 30″, we were near two inlets, of which the easternmost was named Burnet Inlet, and the other Stratton Inlet. The land between these two had very much the appearance of an island. We rounded to, for the purpose of sounding, as well as to wait for our consort, and found no bottom with one hundred and seventy fathoms of line, the water being of a dirty light-green colour. The cliffs on this part of the coast present a sin-
Wed. 4. gular appearance, being stratified horizontally, and having a number of regular projecting masses of rock, broad at the bottom, and coming to a point at the top, resembling so many buttresses, raised by art at equal intervals. This very remarkable constructure, which continues with little variation along the whole of this northern shore, will be best understood by the accompanying views by Lieutenant Beechey, which, from the accuracy with which the coast is delineated, will, I doubt not, be considered equally valuable by the geologist and the seaman.

After lying-to for an hour, we again bore up to the westward, and soon after discovered a cape, afterwards named by Captain Sabine, Cape Fellfoot, which appeared to form the termination of this coast; and as the haze, which still prevailed to the south, prevented our seeing any land in that quarter, and the sea was literally as free from ice as any part of the Atlantic, we began to flatter ourselves that we had fairly entered the Polar sea, and some of the most sanguine among us had even calculated the bearing and distance of Icy Cape, as a matter of no very difficult or improbable accomplishment. This pleasing prospect was rendered the more flattering by the sea having, as we thought, regained the usual oceanic colour, and by a long swell which was rolling in from the southward and eastward. At six P.M., however, land was reported to be seen a-head. The vexation and anxiety produced on every countenance by such a report, was but too visible, until, on a nearer approach, it was found to be only an island, of no very large extent, and that, on each side of it, the horizon still appeared clear for several points of the compass. More land was also discovered beyond Cape Fellfoot, immediately to the westward of which lies a deep and broad bay, which I named after my friend, Mr. Maxwell, to whose kindness and unremitting attention, I am more indebted than it might be proper here to express. At eight P.M., we came to some ice of no great breadth or thickness, extending several miles in a direction nearly parallel to our course; and as we could see clear water over it to the southward, I was for some time in the

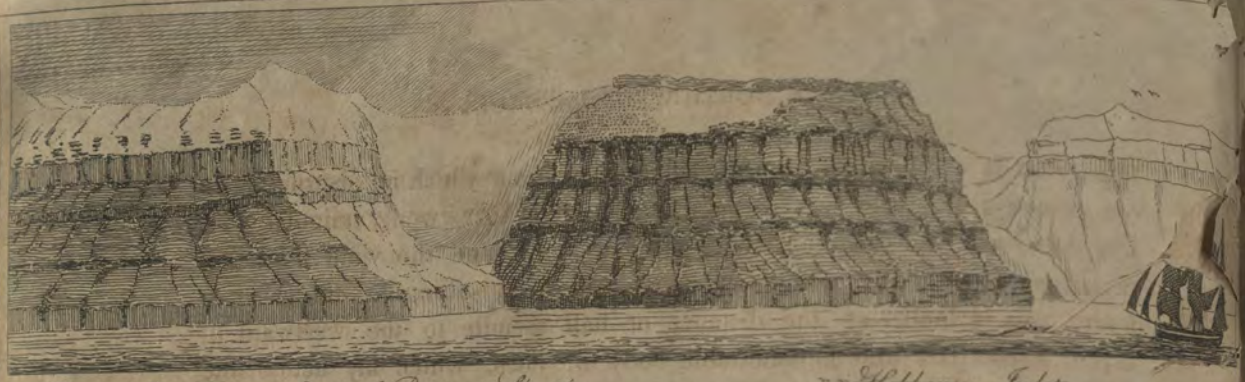
Drawn & Engraved by W. Westall A.R.A. from a Sketch by Lieut. Heppner

Burnet Inlet. Barrow's Strait.

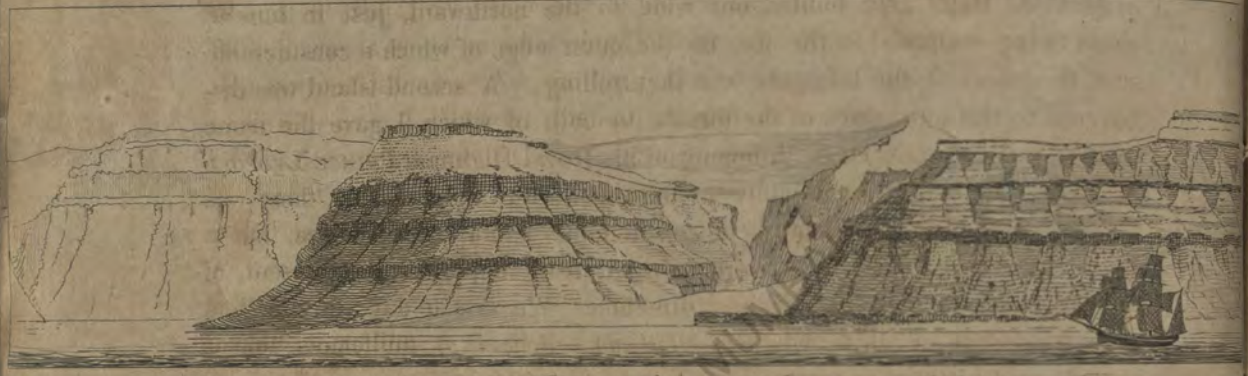
ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI



Part of the Northern Coast of Barrow's Strait. — Hobhouse Inlet.



Continuation of Northern Coast of Barrow's Strait to the Eastward of Hobhouse Inlet.

ASIATIC SOCIETY MUMBAI

— Cape Fellfoot.

E. W. Beechey del.

Continuation of the Coast of Barrow's Strait to the Eastward of Cape Fellfoot.

I. Clark sc.

London, Published by J. Murray, 1821.

hope, that it would prove a detached stream, from which no obstruction to our progress westerly was to be apprehended. At twenty minutes past ten, however, the weather having become hazy, and the wind light, we perceived that the ice, along which we had been sailing for the last two hours, was joined, at the distance of half a mile to the westward of us, to a compact and impenetrable body of floes, which lay across the whole breadth of the strait, formed by the island, and the western point of Maxwell Bay. We hauled our wind to the northward, just in time to avoid being embayed in the ice, on the outer edge of which a considerable surf, the effect of the late gale, was then rolling. A second island was discovered to the southward of the former, to both of which I gave the name of PRINCE LEOPOLD'S ISLES, in honour of his Royal Highness PRINCE LEOPOLD OF SAXE COBURG. Immediately to the eastward of these islands, there was a strong water sky, indicating a considerable extent of open sea, but a bright ice blink to the westward afforded little hope, for the present, of finding a passage in the desired direction. We saw to-day, for the first time, a number of white whales; *(Delphinus Albicans;)* guillemots, fulmar petrels, and kittiwakes, were also numerous near the ice. 1819. August.

The easterly wind died away on the morning of the 5th, and was succeeded by light and variable airs, with thick, snowy weather. At noon we were in lat. 74° 19′ 38″, long. 89° 18′ 40″, the soundings being one hundred and thirty-five fathoms, on a muddy bottom. At half-past ten we tried whether there were any current, and if so, in what direction it might be setting, by mooring a boat to the bottom, with the deep-sea clamms; but none could be detected. An hour before, the same experiment had been tried on board the Griper, when Lieutenant Liddon found the current to be setting east, at the rate of nine miles per day. While the calm and thick weather lasted, a number of the officers and men amused themselves in the boats, in endeavouring to kill some of the white whales which were swimming about the ships in great numbers; but the animals were so wary, that they would scarcely suffer the boats to approach them within thirty or forty yards without diving. Mr. Fisher described them to be generally from eighteen to twenty feet in length; and he stated, that he had several times heard them emit a shrill, ringing sound, not unlike that of musical glasses when badly played. This sound, he further observed, was most distinctly heard, when they happened to swim directly beneath the boat, even when they were several feet under water, and ceased altogether Thurs. 5.

1819. August. on their coming to the surface. We saw also, for the first time, one or two shoals of narwhals, *(Monodon Monoceros,)* called by the sailors, sea-unicorns.

A steady breeze springing up from the W.N.W. in the afternoon, the ships stood to the northward, till we had distinctly made out, that no passage to the westward could at present be found between the ice and the land. The weather having become clear about this time, we perceived that there was a large open space to the southward, where no land was visible; and for this opening, over which there was a dark water-sky, our course was now directed. It fell calm again, however, in a few hours, so that at noon,

Frid. 6. on the 6th, we were still abreast of Prince Leopold's Islands, which were so surrounded by ice, that we could not approach them nearer than four or five miles. The appearance of these islands is not less remarkable than that of the northern shore of the strait, being also stratified horizontally, but having none of those buttress-like projections before described. The different strata form so many shelves, as it were, on which the snow lodges; so that, immediately after a fall of snow, the islands appear to be striped with white and brown alternately. The northernmost island, when seen from the E.N.E., appears like a level piece of table-land, being quite perpendicular at each extreme.

The Griper having unfortunately sprung both her topmasts, Lieut. Liddon took advantage of the calm weather to shift them. The Hecla's boats were at the same time employed in bringing on board ice, to be used as water; a measure to which it is occasionally necessary to resort in these regions, when no pools or ponds are to be found upon the floes. In this case, berg-ice, when at hand, is generally preferred; but that of floes, which is in fact the ice of sea-water, is also abundantly used for this purpose: the only precaution which it is necessary to observe, being that of allowing the salt water to drain off before it is dissolved for use. One of our boats was upset by the fall of a mass of ice which the men were breaking, but fortunately no injury was sustained.

A breeze sprung up from the N.N.W. in the evening, and the Griper being ready to make sail, we stood to the southward. The land, which now became visible to the south-east, discovered to us, that we were entering a large inlet, not less than ten leagues wide at its mouth, and in the centre of which no land could be distinguished. The western shore of the inlet, which extended as far as we could see to the S.S.W., was so encumbered with ice, that there was no possibility of sailing near it. I, therefore, ran

The Southernmost of Prince Leopold's Islands.

The Northernmost of Prince Leopold's Islands, bearing N. 72° W.

Cape York bearing E. by N.

W. Beechey del. J. Clark sculp.

View off Port Bowen & Prince Regents Inlet, bearing South.

London, Published by J. Murray, 1821.

ASIATIC SOCIETY MUMBAI

along the edge of the ice, between which and the eastern shore, there was a broad and open channel, with the intention of seeking, in a lower latitude, a clearer passage to the westward than that which we had just been obliged to abandon lying between Prince Leopold's Isles, and Maxwell's Bay. The headland, which forms the western point of the entrance into this inlet, was honoured by the name of CAPE CLARENCE, after HIS ROYAL HIGHNESS THE DUKE OF CLARENCE; and another, to the south-eastward of this, was named after SIR ROBERT SEPPINGS, one of the Surveyors of His Majesty's navy. 1819. August.

Since the time we first entered Sir James Lancaster's Sound, the sluggishness of the compasses, as well as the amount of their irregularity produced by the attraction of the ship's iron, had been found very rapidly, though uniformly, to increase, as we proceeded to the westward; so much, indeed, that, for the last two days, we had been under the necessity of giving up altogether the usual observations for determining the variation of the needle on board the ships. This irregularity became more and more obvious as we now advanced to the southward. The rough magnetic bearing of the sun at noon, or at midnight, or when on the prime vertical, as compared with its true azimuth, was sufficient to render this increasing inefficiency of the compass quite apparent. For example, at noon this day, while we were observing the meridian altitude, the bearing of the sun was two points on the Hecla's larboard bow, and consequently her true course was about S.S.W. The binnacle and azimuth compasses at the same time agreed in shewing N.N.W. $\frac{1}{2}$ W., making the variation to be allowed on that course, eleven points and-a-half westerly, corresponding nearly with an azimuth taken on the following morning, which gave 137° 12′. It was evident, therefore, that a very material change had taken place in the dip, or the variation, or in both these phenomena, since we had last an opportunity of obtaining observations upon them; which rendered it not improbable that we were now making a very near approach to the magnetic pole. This supposition was further strengthened on the morning of the 7th; when, having decreased our latitude to about 73°, we found that no alteration whatever in the absolute course on which the Hecla was steering, produced a change of more than three or four points in the direction indicated by the compass, which continued uniformly from N.N.E. to N.N.W., according as the ship's head was placed on one side or the other of the magnetic meridian. We now, therefore, witnessed, for the first time, the curious phenomenon of the directive power of the needle becoming so weak as to be completely over- Sat. 7.

1819. August. come by the attraction of the ship; so that the needle might now be properly said to point to the north pole of the ship. It was only, however, in those compasses in which the lightness of the cards, and great delicacy in the suspension, had been particularly attended to, that even this degree of uniformity prevailed; for, in the heavier cards, the friction upon the points of suspension was much too great to be overcome even by the ship's attraction, and they consequently remained indifferently in any position in which they happened to be placed. For the purposes of navigation, therefore, the compasses were from this time no longer consulted; and in a few days afterwards, the binnacles were removed as useless lumber, from the deck to the carpenter's store-room, where they remained during the rest of the season, the azimuth compass alone being kept on deck, for the purpose of watching any changes which might take place in the directive power of the needle: and the *true* courses and direction of the wind were in future noted in the log-book, as obtained to the nearest quarter point, when the sun was visible, by the azimuth of that object and the apparent time.

Being desirous of obtaining all the magnetic observations we were able, on a spot which appeared to be replete with interest in this department of science, and the outer margin of the ice consisting entirely of small loose pieces, which were not sufficiently steady for using the dipping-needle, we hauled up for the nearest part of the eastern shore, for the purpose of landing there with the instruments. We got in with it about noon, having very regularly decreased our soundings from forty to fifteen and a half fathoms; in which depth, having tacked, at the distance of two miles and a half from the shore, two boats were despatched from each ship, under the command of Lieutenants Beechey and Hoppner, who, together with Captain Sabine, were directed to make the necessary observations, and to collect whatever specimens of natural history the place might afford. They landed on a beach of sand and stones, having passed, at the distance of one mile from it, several large masses of ice aground in six to eight fathoms' water, which shoaled from thence gradually in to the shore. The officers describe this spot as more barren and dreary than any on which they had yet landed in the arctic regions; there being scarcely any appearance of vegetation, except here and there a small tuft of stunted grass, and one or two species of saxifrage and poppy, although the ground was so swampy in many places that they could scarcely walk about. This part of the coast is rather low, the highest hill near the landing-place being found, by geometrical measurement, to be only three hundred and eighty-eight feet above the level of the

sea; and there was at this time very little snow remaining upon it. The fixed rocks near the surface consist chiefly of lime-stone; but quartz, granite and hornblende occurred in detached lumps, most of which were incrusted with a thin coat of lime. The bed of a small stream, which ran between two rocks of lime-stone, was composed entirely of clay-slate. The temperature of this stream of water was 42½°, that of the air, in the shade, being 51½°, and of the earth, two or three inches below the surface, 34½°. At a short distance from the sea, Lieutenant Hoppner discovered a large mass of iron-stone, which was found to attract the magnet very powerfully. There were no traces of inhabitants to be seen on this part of the coast. Part of the vertebræ of a whale was found at some distance from the beach; but this had probably been carried there by bears, the tracks of whom were visible on the moist soil. The only birds seen were a few ptarmigans *(Tetrao Lagopus)* and snow buntings. 1819. August.

The latitude of the place of observation was 72° 45′ 15″, and its longitude, by the chronometers, 89° 41′ 22″. The dip of the needle was 88° 26′ 42″, and the variation 118° 23′ 37″ westerly. The directive power of the horizontal needle, undisturbed as it was by the attraction of the ship, was, even here, found to be so weak, in Captain Kater's azimuth-compasses, which were the most sensible, that they required constant tapping with the hand to make them traverse at all. At half-past one, when the boats landed, Lieut. Beechey found the tide ebbing, and it appeared, by the marks on the beach, to have fallen about eighteen inches. At fifty minutes past four, when they left the shore, it had fallen six feet and a half more, by which we considered the time of high water on that day to be about half-past twelve, and about twenty minutes past eleven on the full and change days of the moon. The whole rise of tide, being nearly the highest of the springs, appears to have been ten feet, and the ebb was found to set strong to the southward in-shore. A boat being moored to the bottom, at three miles' distance from the land, at five P.M. not the smallest current was perceptible. From these and several subsequent observations, there is good reason to suppose that the flood-tide comes from the south in this inlet. Before the boats left the shore, a staff was erected on a hill near the landing-place, having a board nailed to it, on which the names of the ships and the date were painted; and at three yards, in the direction of the magnetic north from the staff, which may be distinguished with a glass at three miles' distance from the land, a bottle was buried, with a paper, containing an account of the time, and the object of our visit to this spot.

As soon as the boats returned on board, we bore up to the southward, run-

1819. August. ning close along the edge of the ice, which led us nearer and nearer to the eastern shore, so that by midnight the channel in which we were sailing was narrowed to about five miles. The colour of the water had changed to a very light green at that distance from the shore; but we could find no bottom with fifty fathoms of line, and had thirty-five fathoms while rounding a point of ice at three miles' distance from the beach. The weather was beautifully serene and clear, and the sun, for the second time to us this season, just dipped below the northern horizon, and then re-appeared in a few minutes.

Sun. 8. A dark sky to the south-west had given us hopes of finding a westerly passage to the south of the ice along which we were now sailing; more especially as the inlet began to widen considerably as we advanced in that direction: but at three A.M., on the morning of the 8th, we perceived that the ice ran close in with a point of land bearing S. b. E. from us, and which appeared to form the southern extremity of the eastern shore. To this extreme point I gave the name of Cape Kater, in compliment to Captain Henry Kater, one of the Commissioners of the Board of Longitude, to whom science is greatly indebted for his improvements of the pendulum, and the mariner's compass.

With the increasing width of the inlet, we had flattered ourselves with increasing hopes; but we soon experienced the mortification of disappointment. The prospect from the crow's nest began to assume a very unpromising appearance, the whole of the western horizon, from north round to S. b. E., being completely covered with ice, consisting of heavy and extensive floes, beyond which no indication of water was visible; instead of which there was a bright and dazzling ice-blink extending from shore to shore. The western coast of the inlet, however, trended much more to the westward than before, and no land was visible to the south-west, though the horizon was so clear in that quarter, that, if any had existed of moderate height, it might have been easily seen at this time, at the distance of ten or twelve leagues. From these circumstances, the impression received at the time was, that the land, both on the eastern and western side of this inlet, would be one day found to consist of islands. As a fresh northerly breeze was drifting the ice rapidly towards Cape Kater, and there appeared to be no passage open between it and that cape, I did not consider it prudent, under present circumstances, to run the ships down to the point, or to attempt to force a passage through the ice, and therefore hauled to the wind with the intention of examining a bay which was abreast of us, and to which I gave the name of Fitzgerald Bay, out of respect for Captain Robert Lewis Fitzgerald, of the royal navy.

A boat from each ship was prepared to conduct this examination, and we stood in to drop them in-shore, but found, as we approached, that the bay was so filled with ice, as to render it impracticable for any boat to land. I therefore determined, as the season was fast advancing to a close, to lose no time in returning to the northward, in the hope of finding the channel between Prince Leopold's Isles and Maxwell Bay more clear of ice than when we left it, in which case there could be little doubt of our effecting a passage to the westward; whereas, in our present situation, there appeared no prospect of our doing so without risking the loss of more time than I deemed it prudent to spare. 1819. August.

I have before observed that the east and west lands which form this grand inlet are probably islands: and, on an inspection of the charts, I think it will also appear highly probable that a communication will one day be found to exist between this inlet and Hudson's Bay, either through the broad and unexplored channel, called Sir Thomas Rowe's Welcome, or through Repulse Bay, which has not yet been satisfactorily examined. It is also probable, that a channel will be found to exist between the western land and the northern coast of America; in which case the flood-tide which came from the southward may have proceeded round the southern point of the west land out of the Polar sea, part of it setting up the inlet, and part down the Welcome, according to the unanimous testimony of all the old navigators, who have advanced up the latter channel considerably to the northward.

The distance which we sailed to the southward in this inlet was about one hundred and twenty miles, Cape Kater being, by our observations, in lat. 71° 53′ 30″, long. 90° 03′ 45″; and I saw no reason to doubt the practicability of ships penetrating much farther to the south, by watching the occasional openings in the ice, if the determining the geography of this part of the arctic regions be considered worth the time which must necessarily be occupied in effecting it. The ice which we met with in the southern part of this inlet was much less broken into pieces than that to the northward; and the floes, some of which not less than nine or ten feet thick, were covered with innumerable little round "hummocks," as they are called by the Greenland seamen, which are perhaps first formed by the drift of the snow in particular situations, and which by alternate thawing and freezing, become as solid and transparent as any other part of the ice. This peculiarity I never remember to have remarked on the floes in Baffin's Bay, on which a carriage might travel without much inconvenience, except

1819. August. that which arises from the numerous pools of water found upon them in the latter part of the summer.

From latitude 73° to the farthest progress made to the southward, we found the soundings remarkably regular in approaching the eastern shore. The colour of the water was always observed to change to a beautiful light green before we could obtain soundings with a line of forty fathoms, which occur generally at the distance of four or five miles from the land; after which the depth decreases so gradually that the lead appears to be a safe guide. The bottom is principally mud, into which the lead sinks deep; but there is also some hard ground, and a few pieces of limestone were occasionally brought up by the lead.

The directive power of the magnet seemed to be weaker here than ever; for the north pole of the needle in Captain Kater's steering compass, in which the friction is almost entirely removed by a thread suspension, was observed to point steadily towards the ship's head, in whatsoever direction the latter was placed. It is probable, therefore, that the magnetic dip would have been found somewhat greater here than at our place of observation on the 7th; and it was a matter of regret to me that the primary object of the expedition would not allow of another day's detention for the purpose of repeating the magnetic observations on this spot.

Mon. 9. As we returned to the northward with a light, but favourable breeze, we found that the ice had approached the eastern shore of the inlet, leaving a much narrower channel than that by which we had entered; and in some places it stretched completely across to the land on this side, while the opposite coast was still as inaccessible as before.

On the evening of the 9th, a circular prismatic halo was seen round the sun, with a bright parhelion on each side at the same altitude with the sun. The radius of the circle was 23° 06′. Several black whales, and multitudes of white ones, were seen in the course of the day, also several narwhals and seals, and one bear. There was an iceberg in sight.

Tues. 10. On the 10th, the weather was very thick with snow, which was afterwards succeeded by rain and fog. The compasses being useless, and the sun obscured, we had no means of knowing the direction in which we were going, except that we knew the wind had been to the southward before the fog came on, and had found by experience that it always blew directly up or down the inlet, which enabled us to form a tolerably correct judgment of our course. We continued to stand off-and-on near the ice, till the

evening, when, the fog having cleared away, we bore up to the northward, keeping as near the western shore as the ice would permit; but at eleven P.M., we were stopped in our progress by the ice extending to the land on the eastern side of the inlet, which obliged us to haul our wind. This part of the coast is much higher than that farther to the southward, and the soundings near it are also considerably deeper. 1819. August.

On the 11th, the weather was so thick with fog and rain, that it was impossible to ascertain in what direction we were going, which obliged me to make the ships fast to a floe till the weather should clear up. There being abundance of the purest water in pools upon the floe, our supply of this necessary article was completed on board each ship, and in the mean time, Captain Sabine took the opportunity of repeating his observations upon the dip of the magnetic needle, the result of which, being 88° 25′ 17″, served to confirm those made on shore on the 7th. The repetition of such observations, which require considerable care and delicacy, is always satisfactory; but was particularly so on this occasion from the circumstance already mentioned of having found at some distance from the place of observation on the 7th, a mass of magnetic iron stone, from which, or from other similar substances, it was possible that the needle might have suffered some disturbance. Captain Sabine also made some observations here on the intensity of the magnetic force, which will be found in the Appendix. In the evening, the boats succeeded in harpooning a narwhal, to the great delight of our Greenland sailors, who take so much pleasure in the sport to which they have been accustomed, that they could with difficulty be restrained at times from striking a whale, though such a frolic would almost inevitably have been attended with the loss of one or more of our lines. A few kittiwakes and arctic gulls were flying about the ice. Wed. 11.

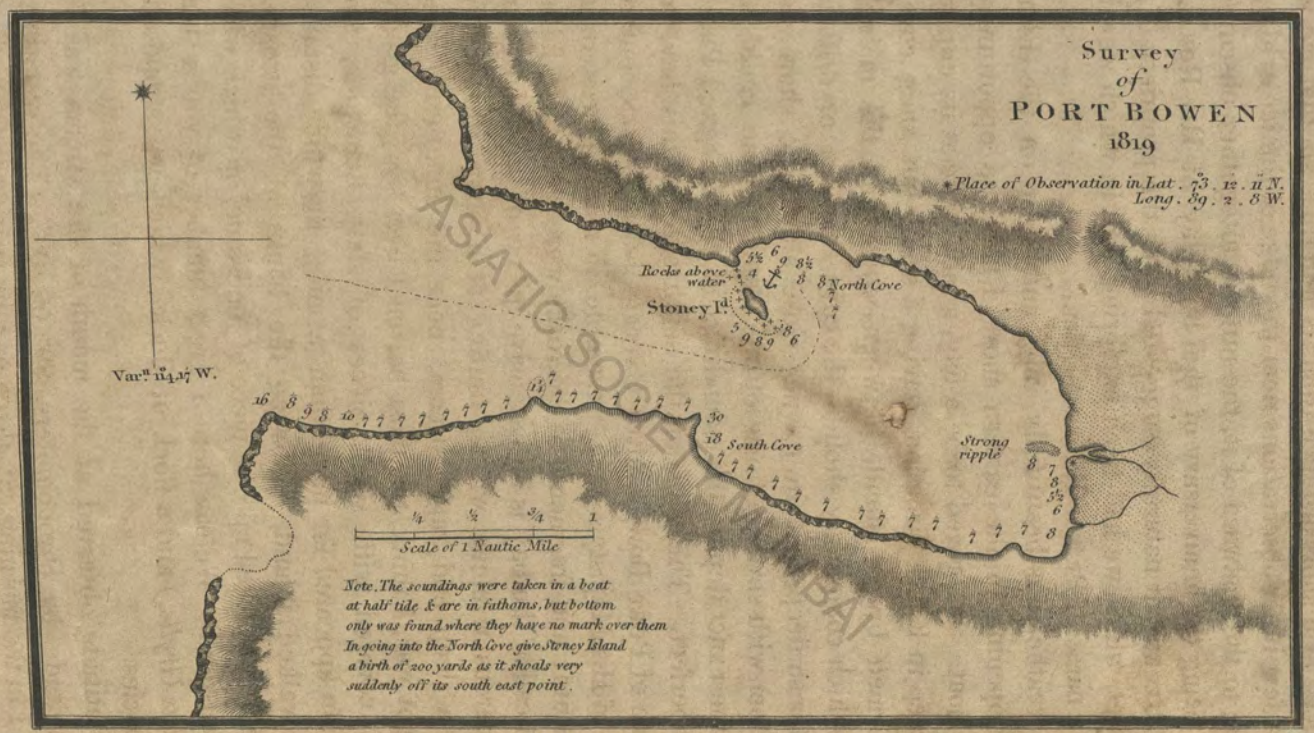
A breeze sprung up from the northward on the morning of the 12th, but the weather was so foggy for some hours that we did not know in what direction it was blowing. As soon as the fog cleared away, so as to enable us to see a mile or two around us, we found that the floe to which we had anchored was drifting fast down upon another body of ice to leeward, threatening to enclose the ships between them. We, therefore, cast off, and made sail, in order to beat to the northward, which we found great difficulty in doing, owing to the quantity of loose ice with which this part of the inlet was now covered. A remarkably thick fog obscured the eastern land from our view this evening at the distance of five or six miles, while the western Thurs. 12.

1819. August. coast was distinctly visible at four times that distance. We remarked, in standing off and on, near the main body of the ice, that the clear atmosphere commenced at a short distance from its margin; so that we were enabled to obtain a few lunar observations near the edge of the ice, while, at the distance of a mile to the eastward of it, the sun was altogether obscured by fog.

This being the anniversary of the birth-day of His Royal Highness the Prince Regent, it naturally suggested to us the propriety of honouring the large inlet, which we had been exploring, and in which we still were sailing, with the name of Prince Regent's Inlet.

Frid. 13. The weather was beautifully calm and clear on the 13th, when, being near an opening in the eastern shore, I took the opportunity of examining it in a boat. It proved to be a bay, a mile wide at its entrance, and three miles deep in E.b.S. direction, having a small but snug cove on the north side, formed by an island, between which and the main land is a bar of rocks, which completely shelters the cove from sea or drift ice. We found the water so deep, that in rowing close along the shore we could seldom get bottom with seven fathoms of line; and, as time could not be spared to obtain the exact depth, the soundings in the annexed Plan are necessarily very imperfect. The cliffs on the south side of this bay, to which I gave the name of Port Bowen, after Captain James Bowen, one of the Commissioners of His Majesty's navy, resemble, in many places, ruined towers and battlements; and fragments of the rocks were constantly falling from above. At the head of the bay is an extensive piece of low, flat ground, intersected by numerous rivulets, which, uniting at a short distance from the beach, formed a deep and rapid stream, near the mouth of which we landed. This spot was, I think, the most barren I ever saw, the ground being almost entirely covered with small pieces of slaty limestone, among which no vegetation appeared for more than a mile, to which distance Mr. Ross and myself walked inland, following the banks of the stream. Among the fragments, we picked up one piece of limestone, on which was the impression of a fossil-shell. We saw here a great number of young black guillemots, *(Colymbus Grylle,)* and a flock of ducks, which we supposed to be of the eider species.

The latitude observed at the mouth of the stream was 73° 12′ 11″, and the longitude, by chronometers, 89° 02′ 08″. The variation of the needle, observed in the morning, at three or four miles' distance from the land, was 114° 16′ 43″ westerly. From twenty minutes past eleven till a quarter after


Survey
of
PORT BOWEN
1819
Place of Observation in Lat. 73. 12. 11 N.
Long. 89. 2. 8 W.
Rocks above water
Stoney Id.
North Cove
South Cove
Strong ripple
Var.n 11°.17' W.
¼ ½ ¾ 1
Scale of 1 Nautic Mile
Note. The soundings were taken in a boat at half tide & are in fathoms, but bottom only was found where they have no mark over them
In going into the North Cove give Stoney Island a birth of 200 yards as it shoals very suddenly off its south east point.

ASIATIC SOCIETY MUMBAI

Published by John Murray Albemarle Street London March 1821.

J Walker Sculpt.

ASIATIC SOCIETY MUMBAI

twelve, the tide rose by the shore six inches, and the high-water mark was between two and three feet above this: but we were not long enough on shore to form a correct judgment of the time at which high water takes place. About three-quarters of a mile to the southward of Port Bowen is another small bay, which we had not time to examine. 1819. August.

Soon after I returned on board, a light breeze from the southward enabled us to steer towards Prince Leopold's Islands, which, however, we found to be more encumbered with ice than before, as we could not approach them so near as at first by three or four miles. The narwhals were here very numerous; these animals appear fond of remaining with their backs exposed above the surface of the water, in the same manner as the whale, but for a much longer time, and we frequently also observed their horns erect, and quite stationary for several minutes together. Three or four miles to the northward of Port Bowen we discovered another opening, having every appearance of a harbour, with an island near the entrance; I named it after CAPTAIN SAMUEL JACKSON, of the Royal Navy.

The whole of the 14th was occupied in an unsuccessful attempt to find an opening in the ice to the westward, which remained perfectly close and compact, with a bright ice-blink over it. Our latitude at noon was 73° 35′ 30″, longitude 89° 01′ 20″, being in two hundred and ten fathoms of water, on a muddy bottom. Some water, brought up in Doctor Marcet's bottle from one hundred and eighty-five fathoms, was at the temperature of 34°, that of the surface being the same, and of the air 39°. Sat. 14.

The ice continued in the same unfavourable state on the 15th; and being desirous of turning to some account this vexatious but unavoidable detention, I left the ship in the afternoon, accompanied by Captain Sabine and Mr. Hooper, in order to make some observations on shore, and directed Lieutenant Liddon to send a boat from the Griper for the same purpose. We landed in one of the numerous valleys, or ravines, which occur on this part of the coast, and which, at a few miles' distance, very much resemble bays, being bounded by high hills, which have the appearance of bluff headlands. We found the water very deep close to the beach, which is composed of rounded limestones, and on which there was no surf; we then ascended, with some difficulty, the hill on the south side of the ravine, which is very steep, and covered with innumerable detached blocks of limestone, some of which are constantly rolling down from above, and which afford a very insecure footing. From the top of this hill, which is about six or seven hundred feet Sun. 15.

1819. August. above the level of the sea, and which commands an extensive view to the westward, the prospect was by no means favourable to the immediate accomplishment of our object. No water could be seen over the ice to the north-west, and a bright and dazzling blink covered the whole space comprised between the islands and the north shore. It was a satisfaction, however, to find that no *land* appeared which was likely to impede our progress; and we had been too much accustomed to the obstruction occasioned by ice, and too well aware of the suddenness with which that obstruction is often removed, to be at all discouraged by present appearances.

On the top of this hill we deposited a bottle, containing a short notice of our visit, and raised over it a small mound of stones; of these we found no want, for the surface was covered with small pieces of schistose limestone, and nothing like soil or vegetation could be seen. We found a great quantity of madreporite among the lime, and at the foot of the hill I met with one large piece, of the basaltiform kind. Several pieces of flint were also picked up on the beach. The insignificance of the stream which here emptied itself into the sea, formed, as usual, a striking contrast with the size of the bed through which it flowed, the latter being several hundred feet deep, and two or three hundred yards wide.

The latitude of this place is 73° 33′ 15″ N., and the longitude by our chronometers, 88° 18′ 17″; the dip of the magnetic needle was 87° 35′.95, and its variation 115° 37′ 12″ westerly. The tide was found to rise three feet from ten minutes past three till seven P.M.; during the whole of which time the stream, within one or two miles of the shore, was carrying the loose pieces of ice to the southward, at the rate of about a mile and-a-half an hour. By observing the ships, however, at five miles' distance in the offing, I had reason to believe that they were set in the contrary direction, and that the current observed by us in-shore, was only an eddy, and not the true direction of the flood-tide. The time of high water here, on full and change days of the moon, will probably be about eleven o'clock. A very large black whale was seen near the beach, and a great number of seals, though seldom more than two of the latter together. We saw one, of the kind called by the sailors, "saddle-back," (*Phoca Grænlandica.*)

Mon. 16. The wind was light on the 16th, with cloudy weather, and occasional fogs, and we scarcely altered our position, being hemmed in by ice or land in almost every direction. At five P.M., it being quite calm, we had a good opportunity of trying the set of the tide, which, by the preceding day's

observations, we knew to be rising at this time by the shore. A small boat was moored to the bottom, which consisted of soft mud, in one hundred and ninety-one fathoms, by a deep-sea lead weighing one hundred and fifty pounds, and a current was found to be setting to the N.N.W., at the rate of a quarter of a mile an hour. This served to confirm the remark I had made the preceding day respecting the drift of the ships in the offing; and, unless there be what seamen call a "tide and half tide," would appear to establish the fact of the flood-tide coming from the southward in this part of Prince Regent's Inlet. 1819. August.

On the 17th, we had a fresh breeze, from the S.S.W., with so thick a fog, that in spite of the most unremitting attention to the sails and the steerage, the ships were constantly receiving heavy shocks from the loose masses of ice with which the sea was covered, and which, in the present state of the weather, could not be distinguished at a sufficient distance to avoid them. On the weather clearing up in the afternoon, we saw, for the first time, a remarkable bluff headland, which forms the north-eastern point of the entrance into Prince Regent's Inlet, and to which I gave the name of Cape York, after His Royal Highness the Duke of York. A little to the eastward of Cape Fellfoot, we observed six remarkable stripes of snow, near the top of the cliff, being very conspicuous at a great distance, when viewed from the southward. These stripes, which are formed by the drift of snow between the buttress-like projections before described, and which remained equally conspicuous on our return the following year, have probably at all times much the same appearance, at least about this season of the year, and may, on this account, perhaps, be deemed worthy of notice, as a landmark. Tues. 17.

At half-past ten A.M., on the 18th, it being quite calm, the small boat was moored to the bottom, in two hundred and ten fathoms, by which means the current was ascertained to be setting W.S.W., at the rate of a mile and-a-half an hour; and, from our preceding observations on the time of the tides on shore in this neighbourhood, it can scarcely be doubted that this was the ebb-tide. Wed. 18.

Mr. Crawford, the Greenland mate of the Hecla, being in quest of a narwhal in one of the boats, could not resist the temptation of striking a fine black whale, which rose close to him, and which soon ran out two lines of one hundred and forty fathoms each, when, after towing the boat some distance, the harpoon fortunately drew, and thus saved our lines.

1819. August. There being still no prospect of getting a single mile to the westward in the neighbourhood of Prince Leopold's Islands, and a breeze having freshened up from the eastward in the afternoon, I determined to stand over once more towards the northern shore, in order to try what could there be done towards effecting our passage; and at nine P.M., after beating for several hours among floes and streams of ice, we got into clear water near that coast, where we found some swell from the eastward. There was just light enough at midnight to enable us to read and write in the cabin.

Thur. 19. The wind and sea increased on the 19th, with a heavy fall of snow, which, together with the uselessness of the compasses, and the narrow space in which we were working between the ice and the land, combined to make our situation for several hours a very unpleasant one. At two P.M., the weather being still so thick, that we could at times scarcely see the ship's length a-head, we suddenly found ourselves close under the land, and had not much room to spare in wearing round. We stood off-and-on during the rest of the day, measuring our distance by Massey's patent log, an invaluable machine on this and many other occasions; and in the course of the afternoon, found ourselves opposite to an inlet, which I named after my relation, Sir Benjamin Hobhouse. The snow was succeeded by rain at night; after which the wind fell, and the weather became clear, so that, on

Frid. 20. the morning of the 20th, when we found ourselves off Stratton Inlet, we were enabled to bear up along shore to the westward. The points of ice led us occasionally within two miles of the land, which allowed us to look into several small bays or inlets, with which this coast appears indented, but which it would require more time than we could afford, thoroughly to survey or examine. The remarkable structure of this land, which I have before attempted to describe, is peculiarly striking about Cape Fellfoot, where the horizontal strata very much resemble two parallel tiers of batteries, placed at regular intervals from the top to the bottom of the cliff, affording a grand and imposing appearance. There is a low point running off some distance from Cape Fellfoot, which is not visible till approached within five or six miles. We passed along this point at the distance of four miles, finding no bottom with from fifty to sixty-five fathoms of line. Maxwell Bay is a very noble one, having several islands in it, and a number of openings on its northern shore, which we could not turn aside to explore. It was, however, quite free from ice, and might easily have been examined, had it

been our object to do so, and time would have permitted. A remarkable headland, on the western side, I named after Sir William Herschel. 1819. August.

At six P.M., when we had passed to the westward of Maxwell Bay, the wind failed us, and the opportunity was immediately taken to try the current, by mooring the small boat to the bottom in one hundred and fifty fathoms. The tide was found to set W. $\frac{1}{4}$ N., at the rate of a quarter of a mile per hour; and at nine o'clock, when we tried it again in a similar manner, there was still a slight stream perceptible, setting in the same direction. The mud and small black stones, brought up from the bottom, consisted entirely of limestone, effervescing strongly with an acid.

On the 21st we had nothing to impede our progress but the want of wind, the great opening, through which we had hitherto proceeded from Baffin's Bay, being now so perfectly clear of ice, that it was almost impossible to believe it to be the same part of the sea, which, but a day or two before, had been completely covered with floes to the utmost extent of our view. In the forenoon, being off a headland, which was named after Captain Thomas Hurd, Hydrographer to the Admiralty, we picked up a small piece of wood, which appeared to have been the end of a boat's yard, and which caused sundry amusing speculations among our gentlemen; some of whom had just come to the very natural conclusion, that a ship had been here before us, and that, therefore, we were not entitled to the honour of the first discovery of that part of the sea on which we were now sailing; when a stop was suddenly put to this and other ingenious inductions by the information of one of the seamen, that he had dropped it out of his boat a fortnight before. I could not get him to recollect exactly the day on which it had been so dropped, but what he stated was sufficient to convince me, that we were not at that time more than ten or twelve leagues from our present situation; perhaps not half so much; and that, therefore, here was no current setting constantly in any one direction. A bay, to the northward and westward of Cape Hurd, was called Rigby Bay. Sat. 21.

At nine P.M., the wind being light from the northward, with hazy weather, and some clouds, the electrometer chain was hoisted up to the masthead; but no sensible effect was produced, either upon the pith-balls or the gold-leaf. A thick fog came on at night, which, together with the lightness of the wind, and the caution necessary in navigating an unknown sea under such circumstances, rendered our progress to the westward extremely slow, though we had fortunately no ice to obstruct us. The

1819. August. Sun. 22. narwhals were blowing about us in all directions, and two walruses with a young one were seen upon a piece of ice.

The fog clearing up on the following day, we found ourselves abreast a bay, to which the name of RADSTOCK BAY was subsequently given by Lieut. Liddon's desire, in compliment to the EARL OF RADSTOCK. This bay is formed by a point of land, on the eastern side, which I named CAPE EARDLEY WILMOT; and on the western, by a bluff headland, which was called after CAPTAIN TRISTRAM ROBERT RICKETTS, of the Royal Navy. In the centre of Radstock bay, lies an insular-looking piece of land, which received the name of CASWALL'S TOWER. We now also caught a glimpse of more land to the southward; but, owing to a thick haze which hung over the horizon in that quarter, the continuity of land on a great part of that coast, to the westward of Cape Clarence, remained, for the present, undetermined. Immediately to the westward of us, we discovered more land, occupying several points of the horizon, which renewed in us considerable apprehension, lest we should still find no passage open into the Polar sea. As we advanced slowly to the westward, the land on which Cape Ricketts stands, appeared to be nearly insular; and, immediately to the westward of it, we discovered a considerable opening, which we called GASCOYNE'S INLET, after GENERAL GASCOYNE, and which I should have been glad to examine in a boat, had time permitted. In the afternoon, the weather became very clear and fine, the wind being light from the westward. As this latter circumstance rendered our progress very slow, the opportunity was taken to despatch the boats on shore, for the purpose of making observations; and at the same time, a boat from each ship, under the respective command of Lieutenants Beechey and Hoppner, was sent to examine a bay, at no great distance to the northward and westward of us. The first party landed at the foot of a bluff headland, which forms the eastern point of this bay, and which I named after my friend Mr. RICHARD RILEY, of the Admiralty. They had scarcely landed ten minutes, when a fresh breeze unexpectedly sprung up from the eastward, and their signal of recall was immediately made. They were only, therefore, enabled to obtain a part of the intended observations, by which the latitude was found to be 74° 39′ 51″, the longitude 91° 47″ 36″.8, and the variation of the magnetic needle 128° 58′ 07″ westerly. The cliffs on this part of the coast were observed to consist almost entirely of secondary limestone, in which fossils were abundantly found. There was little or no vegetation in those parts which our gentlemen had an opportunity of examining during their short excursion; but

as a quantity of the dung of rein-deer was brought on board, the interior of the country cannot be altogether unproductive. One or two specimens of the very gull, *(Larus Argentatus,)* and of the *Larus Glaucus*, with the young of the latter alive, were obtained by Captain Sabine; and five black whales were seen near the beach. 1819. August.

Lieutenant Beechey found that the land, which at this time formed the western extreme, and which lies on the side of the bay, opposite to Cape Riley, was an island; to which I, therefore, gave the name of Beechey Island, out of respect to Sir William Beechey. Immediately off Cape Riley, runs a low point, which had some appearance of shoal-water near it, there being a strong ripple on the surface; but Lieutenant Hoppner reported, that he could find no bottom with thirty-nine fathoms, at the distance of two hundred yards from it.

As soon as the boats returned, all sail was made to the westward, where the prospect began to wear a more and more interesting appearance. We soon perceived, as we proceeded, that the land, along which we were sailing, and which, with the exception of some small inlets, had appeared to be hitherto continuous from Baffin's Bay, began now to trend much to the northward, beyond Beechey Island, leaving a large open space between that coast and the distant land to the westward, which now appeared like an island, of which the extremes to the north and south were distinctly visible. The latter was a remarkable headland, having at its extremity two small table hills, somewhat resembling boats turned bottom upwards, and was named Cape Hotham, after Rear-Admiral the Honourable Sir Henry Hotham, one of the Lords Commissioners of the Admiralty. At sunset we had a clear and extensive view to the northward, between Cape Hotham and the eastern land. On the latter several headlands were discovered and named; between the northernmost of these, called Cape Bowden, and the island to the westward, there was a channel of more than eight leagues in width, in which neither land nor ice could be seen from the mast-head. To this noble channel I gave the name of Wellington, after his Grace the Master-General of the Ordnance. The arrival off this grand opening was an event for which we had long been looking with much anxiety and impatience; for, the continuity of land to the northward had always been a source of uneasiness to us, principally from the possibility that it might take a turn to the southward and unite with the coast of America. The appearance of this broad opening, free from ice, and of the land on each side of it, more especially

1819. August. that on the west, leaving scarcely a doubt on our minds of the latter being an island, relieved us from all anxiety on that score; and every one felt that we were now finally disentangled from the land which forms the western side of Baffin's Bay; and that, in fact, we had actually entered the Polar sea. Fully impressed with this idea, I ventured to distinguish the magnificent opening through which our passage had been effected from Baffin's bay to Wellington channel, by the name of BARROW'S STRAIT, after my friend, MR. BARROW, Secretary of the Admiralty; both as a private testimony of my esteem for that gentleman, and as a public acknowledgment due to him for his zeal and exertions in the promotion of Northern Discovery. To the land on which Cape Hotham is situated, and which is the easternmost of the group of islands,) as we found them to be by subsequent discovery,) in the Polar sea, I gave the name of CORNWALLIS ISLAND, after ADMIRAL THE HONOURABLE SIR WILLIAM CORNWALLIS, my first naval friend and patron; and an inlet, seven miles to the northward of Cape Hotham, was called BARLOW INLET, as a testimony of my respect for SIR ROBERT BARLOW, one of the Commissioners of His Majesty's navy.

Though two-thirds of the month of August had now elapsed, I had every reason to be satisfied with the progress which we had hitherto made. I calculated upon the sea being still navigable for six weeks to come, and probably more if the state of the ice would permit us to edge away to the southward in our progress westerly: our prospects, indeed, were truly exhilarating; the ships had suffered no injury; we had plenty of provisions; crews in high health and spirits; a sea, if not open, at least navigable; and a zealous and unanimous determination in both officers and men to accomplish, by all possible means, the grand object on which we had the happiness to be employed.

CHAPTER III.

FAVOURABLE APPEARANCES OF AN OPEN WESTERLY PASSAGE—LAND TO THE NORTHWARD, A SERIES OF ISLANDS—GENERAL APPEARANCE OF THEM—MEET WITH SOME OBSTRUCTION FROM LOW ISLANDS SURROUNDED WITH ICE—REMAINS OF ESQUIMAUX HUTS, AND NATURAL PRODUCTIONS OF *BYAM MARTIN ISLAND*—TEDIOUS NAVIGATION FROM FOGS AND ICE—DIFFICULTY OF STEERING A PROPER COURSE—ARRIVAL AND LANDING ON *MELVILLE ISLAND*—PROCEED TO THE WESTWARD, AND REACH THE MERIDIAN OF 110° W. LONG., THE FIRST STAGE IN THE SCALE OF REWARDS GRANTED BY ACT OF PARLIAMENT.

1819. August. Mon. 23.

A CALM which prevailed during the night kept us nearly stationary off Beechey Island till three A.M. on the 23d, when a fresh breeze sprung up from the northward, and all sail was made for Cape Hotham, to the southward of which it was now my intention to seek a direct passage towards Behring's Strait. Wellington channel, to the northward of us, was as open and navigable, to the utmost extent of our view, as any part of the Atlantic, but as it lay at right angles to our course, and there was still an opening at least ten leagues wide to the southward of Cornwallis Island, I could fortunately have no hesitation in deciding which of the two it was our business to pursue. If, however, the sea to the westward, which was our direct course, had been obstructed by ice, and the wind had been favourable, such was the tempting appearance of Wellington channel, in which there was no visible impediment, that I should probably have been induced to run through it, as a degree more or less to the northward made little or no difference in the distance we had to run to Icy Cape. The open channel to the westward did not, how-

1819. August. ever, reduce me to this dilemma. It is impossible to conceive any thing more animating than the quick and unobstructed run with which we were favoured, from Beechey Island across to Cape Hotham. Most men have, probably, at one time or another, experienced that elevation of spirits which is usually produced by rapid motion of any kind; and it will readily be conceived how much this feeling was heightened in us, in the few instances in which it occurred, by the slow and tedious manner in which the greater part of our navigation had been performed in these seas. Our disappointment may therefore be imagined, when, in the midst of these favourable appearances, and of the hope with which they had induced us to flatter ourselves, it was suddenly and unexpectedly reported from the crow's-nest, that a body of ice lay directly across the passage between Cornwallis Island and the land to the southward. As we approached this obstruction, which commenced about Cape Hotham, we found that there was, for the present, no opening in it through which a passage could be attempted. After lying to for an hour, however, Lieutenant Beechey discovered from the crow's-nest, that one narrow neck appeared to consist of loose pieces of heavy ice detached from the main floes which composed the barrier, and that, beyond this, there was a considerable extent of open water. The Hecla was immediately pushed into this part of the ice, and, after a quarter of an hour's "boring," during which the breeze had, as usual, nearly deserted us, succeeded in forcing her way through the neck. The Griper followed in the opening which the Hecla had made, and we continued our course to the westward, having once more a navigable sea before us.

We now remarked, that a very decided change had taken place in the character of the land to the northward of us since leaving Beechey Island; the coast near the latter being bold and precipitous next the sea, with very deep water close to it, while the shores of Cornwallis Island rise with a gradual ascent from a beach which appeared to be composed of sand. During the forenoon we passed several riplings on the surface of the water, which were probably occasioned by the set of the tides round each end of Cornwallis Island, as we found a depth of ninety-five fathoms. An opening was seen in the southern land, which I distinguished by the name of CUNNINGHAM INLET, after Captain Charles Cunningham of the Royal Navy, resident Commissioner at Deptford and Woolwich, to whose kindness and attention we were much indebted during the equipment of the ships for this service. A bluff and remarkable cape, which forms the eastern point of Cunningham

Inlet obtained, by Lieutenant Hoppner's desire, the name of Cape Gifford, out of respect to his friend, Mr. Gifford, a gentleman well known and highly respected, as he deserves to be, in the literary world. To the eastward of Cape Gifford, a thick haze covered the horizon, and it prevented us from seeing more land in that direction; so that its continuity from hence to Cape Clarence still remained undetermined, while, to the westward, it seemed to be terminated rather abruptly by a headland, which I distinguished by the name of Cape Bunny. 1819. August.

At noon, we had reached the longitude of 94° 43′ 15″, the latitude, by observation, being 74° 20′ 52″, when we found that the land which then formed the western extreme on this side was a second island, which, after Rear-Admiral Edward Griffith, I called Griffith Island. Immediately opposite to this, upon Cornwallis Island, is a conspicuous headland, which, at some distance, has the appearance of being detached, but which, on a nearer approach, was found to be joined by a piece of low land. To this I gave the name of Cape Martyn, after a much esteemed friend. At two P.M., having reached the longitude of 95° 07′, we came to some heavy and extensive floes of ice, which obliged us to tack, there being no passage between them. We beat to the northward during the whole of the afternoon, with a fresh breeze from that quarter, in the hope of finding a narrow channel under the lee of Griffith Island. In this expectation we were, however, disappointed, for, at eight P.M., we were near enough to perceive not only that the ice was quite close to the shore, but that it appeared not to have been detached from it at all during this season. We, therefore, bore up, and ran again to the southward, where the sea by this time had become rather more clear along the lee margin of a large field of ice extending far to the westward. The ice in this neighbourhood was covered with innumerable "hummocks," such as I have before endeavoured to describe as occurring in the southern part of Prince Regent's Inlet, and the floes were from seven to ten feet in thickness. It may here be remarked, as a fact not altogether unworthy of notice, that, from the time of our entering Sir James Lancaster's Sound, till we had passed the meridian of 92°, near which the northern shore of Barrow's Strait ceases to be continuous, the wind, as is commonly the case in inlets of this kind, had invariably blown in a direction nearly due east or due west, being that of the shores of the strait. When, therefore, we experienced to-day, for the first time, a fresh breeze blowing steadily from the northward, or

1819. August. directly off the land, we were willing, though perhaps without much reason, to construe this circumstance into an additional indication of the shores near which we were now sailing being altogether composed of islands, down the channels between which the wind blew, and that therefore no obstruction from continued land was any longer to be apprehended.

After various unsuccessful attempts to get through the ice which now lay in our way, we were at length so fortunate as to accomplish this object by "boring" through several heavy "streams," which occasioned the ships to receive many severe shocks; and, at half an hour before midnight, we were enabled to pursue our course, through "sailing ice," to the westward.

Tues. 24. A fog came on, on the morning of the 24th, which once more reduced us to the necessity of depending on the steadiness of the wind for a knowledge of the direction in which we were steering, or of having recourse to the unpleasant alternative of heaving to, till the weather should become clear. The former was, of course, preferred, and we pushed on with all the canvass which the Griper's bad sailing would allow us to carry, using the very necessary precaution of keeping the hand-leads constantly going. We passed one field of ice, of immense length, the distance which we ran along it, without meeting a single break in it, being, according to the report of the officers, from eight to ten miles, and its general thickness about eight feet. In this manner we had sailed between fifteen and twenty miles in a tolerably clear sea, when, on the fog clearing away, at seven A.M., we found, by the bearings of the sun, that the wind had not deceived us, and that we had made nearly all westing during the night's run. We also saw land to the northward of us, at the distance of nine or ten miles, appearing like an island, which it afterwards proved to be, and which I named after Viscount Lowther, one of the Lords of His Majesty's treasury. Shortly after, we also saw land to the south, so that we could not but consider ourselves fortunate in having steered so directly in the proper course for sailing in this channel during the continuance of the foggy weather. The land to the southward was high and bold, being terminated to the eastward by a bluff headland, which I named after Mr. Walker, of the Hydrographical Office, at the Admiralty. Immediately at the back of Cape Walker, or to the southward of it, the loom of land was distinctly visible, but, from the state of the weather, we could not ascertain its extent. We here obtained soundings in sixty-three fathoms, on a bottom of sand and small stones, with some pieces of coral.

The wind, drawing more to the westward soon after the clearing up of the fog, obliged us to beat to windward during the rest of the day between the two lands, that to the southward being loaded with ice, while the shores of Lowther Island were perfectly clear and accessible. As we stood in towards the south-west point of the island, in the afternoon, we found the water deepen from sixty-five to seventy-six fathoms, the latter soundings being at the distance of two miles and a half from the shore: and, in standing off again to the south-westward, came rather unexpectedly to a low sandy-looking island, having a great deal of heavy ice aground near it; to this I gave the name of YOUNG'S ISLAND, after DR. THOMAS YOUNG, Secretary to the Board of Longitude. We tacked in thirty-four fathoms at three miles' distance from this island; and, from the quantity of heavy ice near it, which is a never-failing beacon in these seas, it seems more than probable that it is surrounded by shoal water. 1819. August.

It now became evident that all the land around us consisted of islands, and the comparative shoaliness of the water made great caution necessary in proceeding, surrounded as we were by both land and ice in almost every direction.

In the course of the evening, more land came in sight to the northward; but the distance was at this time too great to enable us to distinguish its situation and extent.

Early on the following morning, Lieutenant Beechey discovered, from the crow's nest, a second low island, resembling Young's Island in size and appearance, and lying between three and four leagues to the northward of it. I gave it the name of DAVY ISLAND, after SIR HUMPHRY DAVY, now President of the Royal Society. The nearest land which we had seen to the northward, on the preceding evening, proved to be another island, four or five miles long from east to west, which I distinguished by the name of GARRETT ISLAND, out of respect to my much-esteemed friend CAPTAIN HENRY GARRETT, of the royal navy, to whose kind offices and friendly attention during the time of our equipment, I must ever feel highly indebted. The land to the northward of Garrett Island was found to be another island of considerable extent, having, towards its eastern end, a remarkable peaked hillock, very conspicuous when seen from the southward. I named this BATHURST ISLAND, in honour of the EARL OF BATHURST, one of His Majesty's principal secretaries of state, and a bay near its south-eastern point, was called BEDFORD BAY. Wed. 25.

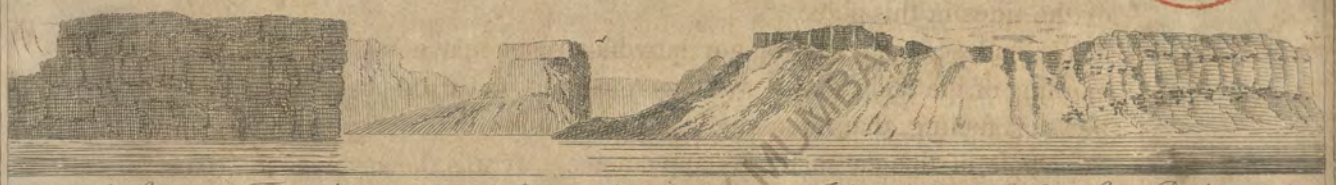
The islands which we had discovered during this day's navigation, among

1819. August. which I have not ventured to include the land to the southward of Lowther Island, of which we obtained a very imperfect view, are generally of a moderate height, not exceeding perhaps four or five hundred feet above the level of the sea. With the exception of some parts of Bathurst Island, which have a more rugged aspect and which rise to a greater elevation than this, we found them entirely clear of snow, and when the sun was shining upon them, they exhibited a brown appearance. In standing in towards Garrett Island, the water was found to deepen from forty to sixty-five, seventy, and eighty fathoms; the latter soundings occurring at two miles distance from the south-eastern point of the island, where we suddenly met with a strong rippling on the surface of the water: as no irregularity could be found in the bottom, this rippling was perhaps occasioned by the meeting of the tides in this place.

Thur. 26. We had seen no whales nor narwhals since leaving Cape Riley on the morning of the 23d; and it was now remarked, not without some degree of unpleasant feeling, that not a single bird, nor any other living creature, had for the whole of this day made its appearance. It was, however encouraging to find, while advancing to the westward, as fast as an unfavourable wind would permit, that, although the sea beyond us was for the most part covered with a compact and undivided body of ice, yet that a channel of sufficient breadth was still left open for us between it and the shore, under the lee of Bathurst Island. The ice here consisted almost entirely of fields, the limits of which were not visible from the mast head, and which were covered with the same kind of hummocks as before described. The westernmost land now in sight was a cape, which I named after Vice-Admiral Sir George Cockburn, one of the Lords Commissioners of the Admiralty. This cape appeared, during the day, to be situated on a small island detached from Bathurst Island; but, on approaching it towards evening, we found them to be connected by a low sandy beach or isthmus, over which some high and distant hills were seen to the north-westward. An opening in the land near this beach, and which had very much the appearance of a river, with some rocky islets at its mouth, was named Allison Inlet, after the Greenland master of the Hecla. The water became very light coloured as we stood in towards this part of the coast, and we tacked in twenty-six fathoms, at six or seven miles' distance from it, continuing to beat to the westward.

We gained so little ground during the night, and in the early part of the following morning, notwithstanding the smoothness of the water, and a fine

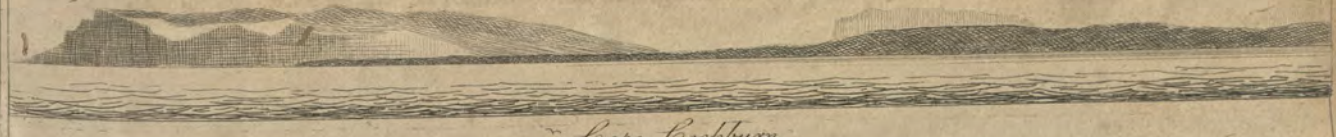
Cape Hotham, bearing W. by S.



Caswall's Tower, bearing N. 36° 16 E. seen through Gascoyne's Inlet. Cape Ricketts.

ASIATIC SOCIETY MUMBAI

Peak on Bathurst Island.



Cape Cockburn.

W. Beechey del. I. Clark sculp.

London, Published by J. Murray, 1821.

ASIATIC SOCIETY MUMBAI

working breeze, that I am confident there must have been a tide setting against us off Cape Cockburn; but, as it was of material importance to get round this headland, before a change of wind should set the ice in upon the shore, I did not deem it proper to heave-to, for the purpose of trying the direction in which it was running. After three A.M., the ships began to make much better way, so that I considered it likely that the tide had slackened between three and four o'clock; and if so, the time of slack water at this place would be, on full and change days, a few minutes after eleven: and as this time, with the proper correction applied, seems to correspond pretty accurately with that of high water at the other places, to the eastward and westward, where we had an opportunity of observing it, we could scarcely doubt that it was the flood-tide which had now been setting against us from the westward. From these circumstances, I have ventured to mark the time of high water, and the direction of the flood-tide, upon the chart, both being confessedly subject to correction by future navigators. Several seals were here seen upon the ice, and a single bird with a long bill, resembling a curlew. 1819. August.

While beating round Cape Cockburn, our soundings were from thirty-three to twenty-one fathoms, on a bottom of small broken shells and coral; and some star-fish (*Asterias*) came up on the lead. After rounding this headland, the wind favoured us by coming to the S.S.W.; and as we stood on to the westward, the water deepened very gradually till noon, when being in latitude, by observation, 75° 01′ 51″, and longitude, by chronometers, 101° 39′ 09″, we sounded in sixty-eight fathoms, on a bottom of mud of a peculiar flesh-colour. The high land, which had been seen on the preceding evening, over the low beach to the eastward of Cape Cockburn, now appeared also to form a part of Bathurst Island, which we afterwards found to be the case, (on our return in 1820,) the intermediate parts of the land being too low to be clearly distinguished at our present distance. The land to the westward of Cape Cockburn sweeps round into a large bay, which I named after Vice-Admiral Sir Graham Moore.

The weather was at this time remarkably serene and clear, and, although we saw a line of ice to the southward of us, lying in a direction nearly east and west, or parallel to the course on which we were steering, and some more land appeared to the westward, yet the space of open water was still so broad, and the prospect from the mast-head, upon the whole, so flattering, that I thought the chances of our separation had now become greater

1819. August. than before; and I therefore considered it right to furnish Lieutenant Liddon with fresh instructions, and to appoint some new place of rendezvous, in case of unavoidable separation from the Hecla. A boat was, therefore, dr[illegible]d on board the Griper for that purpose, without her heaving-to; and the [illegible] opportunity was taken to obtain a comparison between our chronometers. About seven P.M., we were sufficiently near to the western land, to ascertain that it was part of another island, which I named after Vice-Admiral Sir Thomas Byam Martin, Comptroller of His Majesty's navy; and by eight o'clock we perceived that the body of ice to the southward, along which we had been sailing, took a turn to the north, and stretched quite in to the shore, near a low point, off which a great quantity of heavy ice was aground. At ten o'clock, after having had a clear view of the ice and of the land about sunset; and finding that there was at present no passage to the westward, we hauled off to the south-east, in the hope of finding some opening in the ice to the southward, by which we might get round in the desired direction. We were encouraged in this hope by a dark "water-sky" to the southward; but, after running along the ice till half-past eleven, without perceiving any opening, we again bore-up to return towards the island. There was in this neighbourhood, a great deal of that particular kind of ice, called by the sailors "dirty ice," on the surface of which were strewed sand, stones, and in some instances, moss; ice of this kind must, of course, at one time or other, have been in close contact with the land. On one of these pieces, towards which the Hecla was standing, a little sea was observed breaking; and, on a nearer approach, it so exactly resembled a rock above water, that I thought it prudent to heave all the sails aback, till a boat had been sent to examine it. We saw several fulmar petrels, and one or two seals, in the course of this day's run.

Sat. 28. As we approached the south point of the island, to which I gave the name of Cape Gillman, out of respect to the memory of the late Sir John Gillman, we found the ice in the same position as before; and I therefore hauled to the north-east, with the intention of attempting a passage round the north side of the island. In standing in, towards Cape Gillman, our soundings gradually decreased from eighty to twenty-three fathoms, the latter depth occurring at the distance of two to four miles from the shore. At ten A.M., the wind being very light from the S.S.E., I despatched Captain Sabine and Mr. Ross, accompanied by Messrs. Edwards and Fisher, to the eastern point of the island, which we were about to round in the ships, in order to

make the necessary observations, and to examine the natural productions of the shore. Our latitude at noon was 75° 03′ 12″, long. 103° 44′ 37″, and the depth of water forty fathoms. A thick fog came on in the afternoon, soon after the boat had landed, which made me apprehensive that she would not easily find her way back to the ship. We continued to stand off-and-on by the lead, which seems a very safe guide on this coast, firing guns frequently till five P.M., when we were not sorry to hear our signals answered by musquets from the boat. The gentlemen reported, on their return, that they had landed on a sandy beach, near the east point of the island, which they found to be more productive, and altogether more interesting than any other part of the shores of the Polar regions which we had yet visited. The remains of Esquimaux habitations were found in four different places. Six of these, which Captain Sabine had an opportunity of examining, and which are situated on a level sandy bank, at the side of a small ravine near the sea, are described by him as consisting of stones rudely placed in a circular, or rather an elliptical, form. They were from seven to ten feet in diameter; the broad, flat sides of the stones standing vertically, and the whole structure, if such it may be called, being exactly similar to that of the summer huts of the Esquimaux, which we had seen at Hare Island, the preceding year. Attached to each of them was a smaller circle, generally four or five feet in diameter, which had probably been the fire-place. The small circles were placed indifferently, as to their direction from the huts to which they belonged; and from the moss and sand which covered some of the lower stones, particularly those which composed the flooring of the huts, the whole encampment appeared to have been deserted for several years. Very recent traces of the rein-deer and musk-ox were seen in many places; and a head of the latter, with several rein-deers' horns, was brought on board. A few patches of snow remained in sheltered situations; the ravines, however, which were numerous, bore the signs of recent and considerable floods, and their bottoms were swampy, and covered with very luxuriant moss, and other vegetation, the character of which differed very little from that of the land at the bottom of Possession Bay. The basis of the island is sandstone, of which by far the greater part of the mineralogical specimens brought on board consisted; besides these, some rich granite and red feldspar were met with, together with some other substances which are described by Mr. König in the Appendix. A number of shells, of the *Venus* tribe, were found imbedded in the bottom of the ravines. A thermometer, of which the bulb was buried

1819. August.

1819. August. two or three inches in the sand, considerably above high-water mark, indicated the temperature of 35½°; that of the air, the sun being obscured by clouds at the time, being 33½°.

The latitude of the place of observation was 75° 09′ 23″, and the longitude, by chronometers, 103° 44′ 37″. The dip of the magnetic needle was 88° 25′.58, and the variation was now found to have changed from 128° 58′ *West*, in the longitude of 91° 48′, where our last observations on shore had been made, to 165° 50′ 09″ *East*, at our present station; so that we had, in sailing over the space included between those two meridians, crossed immediately to the northward of the magnetic pole, and had undoubtedly passed over one of those spots upon the globe, where the needle would have been found to vary 180°, or in other words, where its north pole would have pointed due south. This spot would, in all probability, at this time be somewhere not far from the meridian of 100° west of Greenwich. It would undoubtedly have been extremely interesting to obtain such an observation, and in any other than the very precarious navigation in which we were now engaged, I should have felt it my duty to devote a certain time to this particular purpose; but, under present circumstances, it was impossible for me to regret the cause which alone had prevented it, especially as the importance to science of this observation was not sufficient to compensate the delay which the search after such a spot would necessarily have occasioned, and which could hardly be justified at a moment when we were making, and for two or three days continued to make, a rapid and unobstructed progress towards the accomplishment of our principal object. Captain Sabine remarked, in obtaining the observations for the variation, that the compasses, which were those of Captain Kater's construction, required somewhat more tapping with the hand, to make them traverse, than they did at the place of observation in Prince Regent's Inlet, on the 7th of August, where the magnetic dcep was very nearly the same; but that, when they had settled, they indicated the meridian with more precision. For instance, on the 7th of August, the compass, when levelled on its stand, would traverse of itself; but if the bearing of any object were observed with it, and the compass frequently removed and replaced, the bearings so obtained would differ from each other, notwithstanding much tapping, to the amount of 3° or 4°; whereas on the present occasion, more sluggishness was observable, yet, at the same time, a closer agreement in the successive results.

The tide was rising by the shore, from noon till half past four P.M., at

which time the boats left the beach; and, by the high-water mark, it was considered probable that it had yet to rise full an hour longer. The time of high water, therefore, may be taken at half past five, which will make that of the full and change days about twelve o'clock. Mr. Ross found, on rowing round the point near which he landed, that the stream was setting strong against him from the northward. We had tried the current in the offing at noon, by mooring the small boat to the bottom, when it was found to be running in a south direction, at the rate of half a mile per hour. At four P.M., near the same station, it was setting S.S.W., five eighths of a mile an hour, so that it would appear tolerably certain that the flood-tide here comes from the northward. 1819. August.

The wind became very light from the eastward, and the weather continued so foggy that nothing could be done during the night but to stand off-and-on, by the soundings, between the ice and the land; as we had no other means of knowing the direction in which we were sailing, than by the decrease in the depth of water on one tack, and by making the ice on the other. The fog froze hard upon the rigging, which always makes the working of the ship a very laborious task, the size of the running rigging being sometimes thus increased to three times its proper diameter. At four A.M. on the 29th, the current was tried by mooring a boat to the bottom, but none could be detected. About this time the fog partially cleared away for a little while, when we observed that the ice was more open off Cape Gillman, than when we had before attempted to pass in that direction. At five o'clock, therefore, we made sail for the point, with a light easterly breeze; but at seven, when we had proceeded only two or three miles, the fog came on again as thick as before: fortunately, however, we had previously been enabled to take notice of several pieces of ice, by steering for each of which in succession, we came to the edge of a floe, along which our course was to be pursued to the westward. As long as we had this guidance, we advanced with great confidence; but as soon as we came to the end of the floe, which then turned off to the southward, the circumstances under which we were sailing were, perhaps, such as have never occurred since the early days of navigation. To the northward was the land; the ice, as we supposed, to the southward; the compasses useless; and the sun completely obscured by a fog, so thick that the Griper could only now and then be seen at a cable's length astern. We had literally, therefore, no mode of regulating our course but by once more trusting to the steadiness of the wind; and it was not a little amusing, as well as novel, to see the quarter-master Sun. 29.

1819. August. conning the ship by looking at the dog-vane. Under all these circumstances, it was necessary to run under easy sail, the breeze having gradually freshened up from the eastward. Our soundings were at this time extremely regular, being from forty-one to forty-five fathoms, on a bottom of soft mud. At ten o'clock the weather became clear enough to allow us to see our way through a narrow part in a patch of ice which lay ahead, and beyond which there was some appearance of a "water-sky." There is, however, nothing more deceitful than this appearance during a fog, which, by the same optical illusion whereby all other objects become magnified, causes every small "hole," of clear water to appear like a considerable extent of open and navigable sea. We continued running till eleven P.M., when the fog came on again, making the night so dark that it was no longer possible to proceed in any tolerable security; I therefore directed the ships to be made fast to a floe, having sailed by our account, twelve miles, the depth of water being forty-four fathoms.

Mon. 30. The fog continued till five A.M. on the 30th, when it cleared sufficiently to give us a sight of the land, and of the heavy ice aground off Cape Gillman, the latter being five or six miles to the northward of us, in which situation we had deepened our soundings to fifty fathoms during the night's drift. The state of the ice, and of the weather, not permitting us to move, Captain Sabine, being desirous of making some use of this unavoidable detention, and considering it at all times important to confirm magnetic observations obtained on shore in these high latitudes, by others taken upon the ice, employed himself in repeating his series of observations on the dip of the needle, which he found to be 88° 29′.12, differing only three minutes and a half from that obtained on shore on the 28th, a few leagues to the northward and eastward of our present station. The floe to which the ships were now secured was not more than six or seven feet in thickness, and was covered with innumerable pools of water, most of which had communication with the sea, as we could with difficulty obtain any that was sufficiently fresh for drinking. In many parts, indeed, there were large holes through which the sea was visible, and the under surface was much decayed and honey-combed, being nearly in that state which the Greenland sailors call "rotten." Some of the officers amused themselves in skating on the pools, all of which were hard frozen on the surface; and the men in sliding, foot-ball, and other games. By putting some drag-nets and oyster-dredges overboard, and suffering them to drag along the ground as the ship drifted with the ice, we obtained a few specimens of marine insects.

In the evening a quantity of loose ice drifted down near the ships; and, to avoid being beset, we made sail towards the island, our soundings being from thirty-five to seventeen fathoms: we were soon under the necessity of again anchoring to a floe, till the weather should clear, being in twenty-one fathoms, at the distance of three miles from the land. 1819. August.

The weather cleared a little at intervals, but not enough to enable us to proceed till nine A.M. on the 31st, when we cast off from the ice, with a very light air from the northward. We occasionally caught a glimpse of the land through the heavy fog-banks, with which the horizon was covered, which was sufficient to give us an idea of the true direction in which we ought to steer. Soon after noon we were once more enveloped in fog, which however, was not so thick as to prevent our having recourse to a new expedient for steering the ships, which circumstances at the time naturally suggested to our minds. Before the fog re-commenced, and while we were sailing on the course which by the bearings of the land we knew to be the right one, the Griper was exactly astern of the Hecla, at the distance of about a quarter of a mile. The weather being fortunately not so thick as to prevent our still seeing her at that distance, the quarter-master was directed to stand aft, near the taffrail, and to keep her constantly astern of us, by which means we contrived to steer a tolerably straight course to the westward. The Griper, on the other hand, naturally kept the Hecla right a-head; and thus, however ridiculous it may appear, it is, nevertheless, true, that we steered one ship entirely by the other for a distance of ten miles out of sixteen and a half, which we sailed between one and eleven P.M. It then became rather dark, and the water having shoaled from fifty to twenty-three fathoms somewhat more suddenly than usual, I did not consider it prudent to run any farther till it should become light and clear enough to see around us, as it was probable that we were approaching land of which we had no knowledge. We therefore hauled our wind to the S.S.E., on the larboard tack, and at midnight had deepened the water to fifty-two fathoms, being among rather close "sailing ice*." Tues. 31.

The wind died away on the morning of the 1st of September, and the fog was succeeded by snow and sleet, which still rendered the atmosphere extremely thick. At a quarter before four A.M., I was informed by the officer of the watch that a breeze had sprung up, and that there was very little ice Sept. Wed. 1.

* The monthly Meteorological Abstracts will be inserted at the end of each month, as being more convenient for reference than if placed in a continued series in the Appendix.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, at Sea, during the Month of *August*, 1819.

Day	Temperature of Air in shade.			Sea Water at the surface.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Temperature.	Specific Gravity.	Temperature when weighed.	Maximum.	Minimum.	Mean.		
	+ °	+ °	+ °	+ °			inches.	inches.	inches.		
1	36	33.5	34.50	32.6	1.0245	55.5	29.60	29.51	29.540	West	Fresh breezes and hazy.
2	41	33	37.00	34.2	1.0255	52	29.73	29.59	29.660	N.E.bE. roundby South to West	From fresh breezes to calms. Fine weather.
3	38	33	35.58	33.2	1.0247	55	29.70	29.50	29.632	A.M. S.WbW. P.M. East.	Moderate breezes and hazy.
4	37.5	33.5	35.29	32.8	1.0248	55	29.51	29.45	29.481	East	Strong breezes and hazy.
5	35	33.5	34.25	31.7	....	....	29.51	29.48	29.496	N.W.	Light airs and cloudy, with snow.
6	35	33	33.83	31.8	1.0232	59	29.56	29.51	29.530	North	Light breezes and cloudy.
7	36	31	33.83	31.6	1.0248	58	29.60	29.53	29.562	North	Moderate breezes and cloudy.
8	35	30	32.62	31.5	1.0256	38	29.65	29.60	29.622	N.W.	Light breezes and cloudy.
9	39.5	30.5	33.92	30.9	1.0255	56	29.67	29.62	29.650	N.W.bW. to S.S.W.	Ditto.
10	36	31	33.00	31.2	1.0246	60	29.55	29.52	29.540	S.bW.	Moderate breezes and hazy, with rain and snow.
11	35	33	33.12	31.0	1.0211	56	29.66	29.49	29.567	S.bW.	Moderate and foggy, with continued rain.
12	35	30	32.58	31.4	1.0240	55	29.85	29.80	29.820	N.bE.	Moderate and foggy, with rain at intervals.
13	40	30	36.88	32.2	1.0237	54	29.80	29.72	29.810	S.W.	Light airs and fine clear weather.
14	42	34	36.75	32.7	1.0239	55	29.76	29.61	29.717	N.N.W. to S.S.W.	Ditto ditto.
15	39	32	35.21	33.1	1.0236	55	29.63	29.61	29.620	S. Westerly.	Ditto ditto.
16	36	33	34.00	32.8	1.0242	55	29.68	29.61	29.642	S.S.E. round by S. to W.N.W.	Light airs and hazy; calm at times.
17	35	32	33.12	32.6	1.0242	56	29.66	29.63	29.652	S.W.	Light airs and foggy weather.
18	36	32.5	33.67	32.5	1.0236	55	29.64	29.60	29.625	A.M. S.W.bW. P.M. N.E.bE.	Light breezes and cloudy.
19	33	32	32.83	32.8	1.0233	57	29.55	29.53	29.542	E.bN.	Strong breezes & hazy, with rain, hail, & sleet.
20	36	33	34.86	32.6	1.0233	57	29.63	29.57	29.610	E.bN.	Light breezes and hazy weather.
21	36	33	34.79	32.5	1.0188	58	29.66	29.62	29.650	Round the compass.	Ditto
22	38	33	35.62	33.2	1.0235	54	29.76	29.67	29.720	Ditto.	Light variable airs—A.M. hazy, P.M. clear.
23	36	32	33.75	31.5	1.0247	54	29.76	29.66	29.712	North	Moderate breezes and cloudy.
24	30	28	29.50	30.1	1.0246	54	29.66	29.61	29.634	N.N.W.	Fresh breezes and cloudy.
25	32	30	30.54	30.2	....	....	29.87	29.64	29.767	N.W.	Ditto.
26	35	30	31.92	30.4	....	....	30.06	29.95	30.012	N.W.b.W.	Ditto.
27	34	30.5	32.58	30.9	....	....	29.96	29.80	29.900	S.S.W.	Light breezes and fine clear weather.
28	34	30	32.00	31.8	....	....	29.70	29.60	29.657	S.S.E. to N.E.	Light breezes and foggy.
29	32	31	31.75	31.7	....	....	29.57	29.40	29.482	S.E.	Light airs and foggy.
30	34	30	32.08	31.1	....	....	29.36	29.31	29.332	N.E.	Fresh breezes and foggy.
31	34	31	32.21	31.4	....	....	29.59	29.39	29.510	N.W. round by North to East	Light airs, with sleet and snow.
	42	28	33.67	31.93	....	....	30.06	29.31	29.635		

near the ships. Anxious to take advantage of these favourable circumstances, 1811
I directed all sail to be made to the westward: there was no difficulty in com- Sept
plying with the first part of this order, but to ascertain which way the wind was blowing, and to which quarter of the horizon the ship's head was to be directed, was a matter of no such easy accomplishment; nor could we devise any means of determining this question till five o'clock, when we obtained a sight of the sun through the fog, and were thus enabled to shape our course, the wind being moderate from the northward.

In standing to the southward, we had gradually deepened the water to one hundred and five fathoms, and our soundings now as gradually decreased as we stood to the westward; giving us reason to believe, as on the preceding night, and from the experience we had acquired of the navigation among these islands, that we were approaching land in that direction. In this supposition we were not deceived, for, at half-past eight, the fog having suddenly cleared up, we found ourselves within four or five miles of a low point of land which was named after Mr. Griffiths, and which, being at the distance of six or seven leagues from Byam Martin Island, we considered to be part of another of the same group. We sailed along the shore at the distance of two to four miles in a S.W.b.W. direction, and having dropped a boat to obtain observations upon the ice, without heaving-to for that purpose, we found ourselves to be, at noon, in latitude 74° 59′ 35″, and longitude, by chronometers, 106° 07′ 36″. This land very much resembled, in height and general character, the other islands which we had lately passed, being in most parts of a brownish colour, among which we also imagined a little green to be here and there discernible. We had some small rain in the afternoon, which was succeeded by snow towards midnight.

At one A.M. on the 2d, a star was seen, being the first that had been Thurs. 2.
visible to us for more than two months. The fog came on again this morning, which, together with the lightness of the wind preventing the ships getting sufficient way to keep them under command, occasioned them some of the heaviest blows which they had yet received during the voyage, although the ice was generally so loose and broken as to have allowed an easy passage with a moderate and leading wind. As none of the pieces near us were large enough for securing the ships in the usual manner, we could only heave-to, to windward of one of the heaviest masses, and allow the ship to drive with it till some favourable change should take place. After lying for an hour in this inactive and helpless situation, we again made sail, the weather being

1819. Sept. rather more clear, which discovered to us that the main body of the ice was about three miles distant from the land, the intermediate space being very thickly covered with loose pieces through which our passage was to be sought. As we stood in for the land in the forenoon, we decreased our soundings uniformly from twenty-seven to eleven fathoms at one and a half or two miles from the beach, and a boat, which I sent to sound in-shore, found the water to shoal very regularly to six fathoms at about half a mile. At this distance from the beach, there were many large masses of ice aground; and it was here that the method so often resorted to in the subsequent part of the voyage, of placing the ships between these masses and the land, in case of the ice closing suddenly upon us, first suggested itself to our minds.

As we were making no way to the westward, I directed two boats to be prepared from each ship for the purpose of making the usual observations on shore, as well as to endeavour to kill deer; and, at one P.M., I left the ship, accompanied by a large party of officers and men, and was soon after joined by the Griper's boats. We landed on a very flat sandy beach, which did not allow the boats to come nearer than their own length, and we were immediately struck with the general resemblance in the character of this island to that of Byam Martin Island, which we had lately visited. The basis of this land is sandstone, but we met with limestone also, occurring in loose pieces on the surface, and several lumps of coal were brought in by the parties who had traversed the island in different directions. Our sportsmen were by no means successful, having seen only two deer, which were too wild to allow them to get near them. The dung of these animals, however, as well as that of the musk-ox was very abundant, especially in those places where the moss was most luxuriant; every here and there we came to a spot of this kind, consisting of one or two acres of ground covered with a rich vegetation, and which was evidently the feeding-place of those animals, there being quantities of their hair and wool lying scattered about. Several heads of the musk-ox were picked up, and one of the Hecla's seamen brought to the boat a narwhal's horn which he found on a hill more than a mile from the sea, and which must have been carried thither by Esquimaux or by bears: three or four brace of ptarmigan *(Tetrao Lagopus,)* were killed, and these were the only supply of this kind which we obtained. Serjeant Martin of the artillery, and Captain Sabine's servant, brought down to the beach several pieces of a large fir-tree, which they found nearly buried in the sand, at the distance of three or four hundred yards from the present high-water

mark, and not less than thirty feet above the level of the sea. We found no indication of this part of the island having been inhabited, unless the narwhal's horn, above alluded to, be considered as such. 1819. Sept.

The latitude of the place of observation here, which was within a hundred yards of the beach, was 74° 58′, the longitude, by chronometers, 107° 03′ 31″.7, and the variation of the magnetic needle 151° 30′ 03″ easterly. At forty minutes past one P.M., when the boats landed, the tide had fallen a foot by the shore. It continued to fall till seven P.M., and then rose again, the whole fall of tide not exceeding five or five and a half feet. At the time we landed, Lieutenant Beechey tried for a current in the offing, but could find none; at half-past seven, the tide was setting E.N.E., at the rate of a mile and a half an hour; and, at a quarter before ten, after I returned on board, it was still setting slowly to the eastward. By the above observations, the time of high water, at the full and change of the moon, seems to be about three quarters after one o'clock. The direction of the flood-tide does not appear so clear. If it come from the westward, there must be a tide and half tide; but it seems more than probable, on an inspection of the chart, that here, as on the eastern side of Byam Martin Island, it will be found to come from the northward between the islands. At the top of a hill, immediately above the place of observation, and about a mile from the sea, a bottle was buried, containing the usual information. A mound of sand and stones was raised over it, and a boarding-pike fixed in the middle. We returned on board at half past eight, and found that Lieutenant Beechey had, in the mean time, taken a number of useful soundings, and made other hydrographical remarks for carrying on the survey of the coast.

The wind continued light and variable till half-past eight A.M. on the 3d, when a breeze from the northward once more enabled us to make some progress. I was the more anxious to do so, from having perceived that the main ice had, for the last twenty-four hours, been gradually, though slowly, closing on the shore, thereby contracting the scarcely navigable channel in which we were sailing. The land which formed our western extreme was a low point, five miles to the westward of our place of observation the preceding day, and the ice had already approached this point so much, that there was considerable doubt whether any passage could be found between them. As we neared the point, we shoaled the water rather quickly, though regularly, from thirty to seven fathoms; but, by keeping a little farther out, which fortunately the ice just at that time allowed us to do, we avoided getting into shoaler Frid. 3.

1819. Sept. water, and immediately after rounding the point, we increased our soundings to sixteen and seventeen fathoms. We had scarcely cleared the point, however, when the wind failed us, and the boats were immediately sent a-head to tow, but a breeze springing up shortly after from the westward, obliged us to have recourse to another method of gaining ground which we had not hitherto practised: this was by using small anchors and whale-lines as warps, by which means we made great progress, till, at forty minutes after noon, we were favoured by a fresh breeze, which soon took us into an open space of clear water to the northward and westward. While we were thus employed on board, Mr. Ross, after whom I named this point, had been despatched in a boat to sound in-shore near it, where there were a great many large masses of ice aground, in order that we might be prepared to place the ships in the most advantageous position, should the ice unexpectedly close upon the shore. Mr. Ross reported, that he had found good depth of water in-shore, the ice being aground in five to seven fathoms, after which the water shoaled gradually towards the land. A little to the westward of Point Ross, there was a barrier of this kind of ice, composed of heavy masses firmly fixed to the ground at nearly regular intervals for about a mile, in a direction parallel to the beach. At right angles to this, a second tier projected, of the same kind of ice, extending to the shore, so that the two together formed a most complete harbour, within which, I believe, a ship might have been placed in case of necessity, without much danger from the pressure of the external floes of ice. It was natural for us to keep in view the possibility of our being obliged to pass the ensuing winter in such a harbour; and, it must be confessed, that the apparent practicability of finding such tolerable security for the ships as this artificial harbour afforded, should we fail in discovering a more safe and regular anchorage, added not a little to the confidence with which our operations were carried on during the remainder of the present season.

The land immediately to the north-westward of Point Ross forms a considerable bay, named after Mr. Skene, off which there was a large space of clear water, where we had to beat to the northward during the afternoon, as the ice lay in that direction. In standing off-and-on, we shoaled the water in one place very suddenly from nineteen to eleven fathoms, at the distance of one mile from the beach. Having tacked, I sent Mr. Bushnan to sound in-shore, where a shoal was discovered three quarters of a mile from the land, having three and four fathoms upon it, and

within it from eight to thirteen fathoms. The sun-set of this evening was extremely beautiful, the weather being clear and frosty, and the sky without a cloud. The moon rising soon after, afforded a spectacle no less pleasing, and far more sublime. Her horizontal diameter appeared to be very much elongated when just above the horizon, owing to the unequal refraction of the upper and lower limbs; but it measured 33′ 20″, being only 6″ more than the true, which difference may have arisen from an error in the observation. The vertical diameter measured 30′ 40″. 1819. Sept.

Having weathered all the ice round which we had to sail, in order to proceed to the westward, we were under the necessity of lying-to, off Skene Bay, for some hours, the weather having become very squally and unsettled, with occasional fog, and the night not being sufficiently light to ascertain whether there was a passage between the ice and a point of land which forms the western extreme of the bay. On its eastern side an inlet, two miles wide at the entrance, was discovered, and named after Mr. Beverly, and at the bottom of this we did not see the land all round. At half-past two A.M., we made sail to the westward, the Griper having been directed by signal to extend her distance; a precaution which was always adopted in cases where shoal-water was to be apprehended, in order to avoid the risk of both ships grounding at the same time. As we approached the point, the soundings decreased gradually from thirty to seven fathoms, in which depth I tacked, and despatched Mr. Palmer in a boat to sound round the point, to which I gave the name of Cape Palmer, after the gentleman intrusted with this service. Having been informed by signal from the boat, that no less than six fathoms' water had been found, we again tacked, and soon after rounded the point in that depth, at the distance of three quarters of a mile from a low sandy beach. We then ran several miles along the shore without much obstruction, till the wind, backing to the north-west, obliged us to make several tacks between the ice and the land, the navigable channel being at this time between three and four miles wide. At noon we observed, in latitude 74° 54′ 49″, the longitude, by chronometers, being 108° 31′ 44″, at which time we were off a low, sandy island, which was named after Mr. Dealy, and which lies near the entrance into a large inlet, to which the name of Bridport Inlet was given, from regard to the memory of the late Lord Bridport. This inlet runs a considerable distance to the northward, and seemed to afford good shelter for ships; but, as we had no opportunity of examining it in our boats, I am unable to state any further particulars respecting it. The land to the Sat. 4.

1819. Sept. westward of it, of which the most conspicuous part is a remarkable bluff headland, is much higher than that about Skene Bay; and we ceased to obtain any soundings with the hand-leads after we had passed the entrance of Bridport Inlet. At a quarter-past nine P.M., we had the satisfaction of crossing the meridian of 110° west from Greenwich, in the latitude of 74° 44′ 20″; by which His Majesty's ships, under my orders, became entitled to the sum of five thousand pounds, being the reward offered by the King's order in council, grounded on a late Act of Parliament, to such of His Majesty's subjects as might succeed in penetrating thus far to the westward within the Arctic Circle. In order to commemorate the success which had hitherto attended our exertions, the bluff headland, which we had just passed, was subsequently called by the men BOUNTY CAPE; by which name I have, therefore, distinguished it on the chart.

As we stood to the westward, we found the extreme of the land in that direction to be a low point, which was named after SAMUEL HEARNE, the well-known American traveller, and to the north-eastward of which is a bay of considerable extent, which was perfectly free from ice. We continued our course towards Cape Hearne till midnight, when, the weather being too dark to run any longer with safety, the ships were hove-to with their heads to the eastward. One black whale was seen, in the course of this day's navigation, off Bridport Inlet; and some flocks of snow-buntings were flying about the ship at night.

Sun. 5. At a quarter before three A.M., on the 5th, we tacked, and stood to the westward, with the hope of getting past Cape Hearne, the wind being moderate from the northward, and the weather thick with snow; and, shortly after, we shoaled the water quickly from twenty-five to thirteen, and then to nine, fathoms. We tacked in the latter depth, believing that we were approaching a shoal, especially as we were near some heavy ice, which, having a tide-mark upon it, appeared to be aground. We afterwards found, however, that we had at this time been actually within three or four hundred yards of Cape Hearne, which is so surrounded by heavy ice at a sufficient distance from the shore, that it would perhaps be difficult to run a ship aground upon it. The error into which we were here led, as to our distance from the beach, arose from the extreme difficulty of distinguishing, even in broad day-light, between the ice and the land, when the latter is low and shelving, and completely covered with snow; by the uniform whiteness of which, they are so completely blended, as to deceive the best eye. Indeed,

I know no circumstance in the navigation of these seas which renders more necessary a vigilant look-out, and a careful attention to the hand-leads than the deception to which I here allude. 1819 Sept.

Having stood again to the westward, to take a nearer view of the ice, we perceived that it lay quite close in with Cape Hearne, notwithstanding the fresh northerly wind which, for the last thirty-six hours, had been blowing from the shore, and which had drifted the ice some distance to the southward, in every other part of the coast along which we had lately been sailing. This circumstance struck us very forcibly at the time, as an extraordinary one; and it was a general remark among us, that the ice must either be aground in shoal-water, or that it butted against something to the southward, which prevented its moving in that direction. Appearances being thus discouraging, nothing remained to be done but to stand off-and-on near the point, and carefully to watch for any opening that might occur.

After divine service had been performed, I assembled the officers, seamen, and marines of the Hecla, and announced to them officially, that their exertions had so far been crowned with success, as to entitle them to the first prize in the scale of rewards, granted by His Majesty's order in council abovementioned. I took this opportunity of impressing upon the minds of the men the necessity of the most strenuous exertions during the short remainder of the present season; assuring them that, if we could penetrate a few degrees farther to the westward, before the ships were laid up for the winter, I had little doubt of our accomplishing the object of our enterprise before the close of the next season. I also addressed a letter to Lieutenant Liddon, to the same effect, and directed a small addition to be made to the usual allowance of meat, and some beer to be served, as a Sunday's dinner, on this occasion.

The wind increasing to a fresh gale from the northward in the afternoon, and the ice still continuing to oppose an impenetrable barrier to our further progress, I determined to beat up to the northern shore of the bay, and, if a tolerable roadstead could be found, to drop our anchors till some change should take place. This was accordingly done at three P.M., in seven fathoms' water, the bottom being excellent holding-ground, composed of mud and sand, from which the lead could with difficulty be extricated. When we veered to half a cable, we had ten fathoms' water under the Hecla's stern, our distance from the northern shore being about a mile and a half. This roadstead, which I called the Bay of the Hecla and Griper, affords very

1819. Sept. secure shelter with the wind from E.N.E., round by north, to S.W., and we found it more free from ice than any other part of the southern coast of the island.

I had great reason to be satisfied with our having anchored the ships, as the wind shortly after blew a hard gale from the northward. In the evening I sent Captain Sabine and Messrs. Edwards and Nias on shore to examine the country, and to collect specimens of its natural productions; they returned at ten P.M., having landed on a low point a little to the westward of the ships, which they found to be a very barren and unproductive spot; several flocks of ducks were seen, and some glaucous gulls and tern; the dung and foot-tracks of the deer and musk-ox were also observed in many places; and some addition was made by our gentlemen to our collection of marine insects. The rocks are composed entirely of sandstone, but a few small pieces of granite, flint, and coal, were also among the specimens brought on board. This island, on which our boats had now landed for the second time, and which is much the largest of the group we had lately discovered, I honoured with the name of Melville Island, after Viscount Melville, the First Lord of the Admiralty.

The bay of the Hecla and Griper was the first spot where we had dropped anchor since leaving the coast of Norfolk; a circumstance which was rendered the more striking to us at the moment, as it appeared to mark, in a very decided manner, the completion of one stage of our voyage. The ensigns and pendants were hoisted as soon as we had anchored, and it created in us no ordinary feelings of pleasure to see the British flag waving, for the first time, in these regions, which had hitherto been considered beyond the limits of the habitable part of the world.

CHAPTER IV.

FURTHER EXAMINATION OF MELVILLE ISLAND—CONTINUATION OF OUR PROGRESS TO THE WESTWARD—LONG DETENTION BY THE ICE—PARTY SENT ON SHORE TO HUNT DEER AND MUSK-OXEN—RETURN IN THREE DAYS, AFTER LOSING THEIR WAY—ANXIETY ON THEIR ACCOUNT—PROCEED TO THE WESTWARD, TILL FINALLY STOPPED BY THE ICE—IN RETURNING TO THE EASTWARD THE GRIPER FORCED ON THE BEACH BY THE ICE—SEARCH FOR, AND DISCOVERY OF, A WINTER HARBOUR ON MELVILLE ISLAND—OPERATIONS FOR SECURING THE SHIPS IN THEIR WINTER QUARTERS.

1819. Sept. Mon. 6

As the wind still continued to blow strong from the northward on the morning of the 6th, without any appearance of opening a passage for us past Cape Hearne, I took the opportunity of sending all our boats from both ships at eight A.M., to bring on board a quantity of moss-peat which our gentlemen reported having found near a small lake at no great distance from the sea, and which I directed to be substituted for part of our usual allowance of coals. Captain Sabine also went on shore to make the requisite observations, and several of the officers of both ships to sport, and to collect specimens of natural history. The boats rowed round the point on which they had landed the preceding evening, and which Captain Sabine now selected as the most convenient place of observation; and discovered just beyond it to the northward, a small harbour, having a bar at its entrance, upon which Mr. Fife, the Greenland master of the Griper, after whom the harbour was named, found ten feet water at nearly low tide.

The latitude of the point is 74° 46′ 56″, and its longitude, by our chronometers, 110° 33′ 59″. The dip of the magnetic needle was found to be 88° 29′.91, and the variation 126° 17′ 18″ Easterly. It was low water by the

1819. Sept. shore at half-past nine, and it had risen between two and three feet when the boats came away at half-past twelve. During this time the ships were tending to a tide coming strong from the eastward; from which direction it is therefore probable, that the flood-tide runs on this part of the coast, though we had no satisfactory opportunity of trying its true set in the offing. Near the point where the observations were made, a bottle was buried, containing a paper as usual, and a pile of stones raised over it. The weather was this day unusually cold to the feelings, to a greater degree even than might have been expected from the indication of the thermometer, which, for the first time, had been as low as 25°.

The wind beginning to moderate soon after noon, and there being at length some appearance of motion in the ice near Cape Hearne, the boats were immediately recalled from the shore, and returned at two P.M., bringing some peat, which was found to burn tolerably, but a smaller quantity than I had hoped to procure, owing to a misunderstanding as to the distance at which it was to be found from the sea. At half-past two, as soon as the ship's company had dined, we began to heave at the cable, but so excellent is the holding-ground, that it required all the purchase as well as strength we could apply, to start the anchor by half-past four. We then made sail for Cape Hearne, which we rounded at six o'clock, having no soundings with from seventeen to twenty fathoms of line, at the distance of a mile and a quarter from the point. The extreme of the land which now appeared to the westward bore about S.W.b.W., and there was a sufficient space of clear water along the shore to allow us to steer for it. It was impossible, however, not to remark to how short a distance from the shore, not exceeding three or four miles, the ice had been drifted by the late strong gales. We had observed, however, that in rounding Cape Hearne this evening, the wind had drawn gradually to the eastward as we proceeded, taking nearly the direction of the shore, and we were willing to hope that it had been blowing from the same quarter, while we were lying at anchor in the bay; in which case it was not necessary to suppose any such serious obstruction to the southward as that to which we had at first been inclined to attribute these unfavourable appearances.

I was beginning once more to indulge in those flattering hopes, of which often-repeated disappointments cannot altogether deprive us, when I perceived, from the crow's nest, a compact body of ice, extending completely in to the shore near the point which formed the western extreme. We ran

sufficiently close, to be assured that no passage to the westward could at present be effected, the floes being literally upon the beach, and not a drop of clear water being visible beyond them. I then ordered the ships to be made fast to a floe, being in eighty fathoms' water, at the distance of four or five miles from the beach. The season had now so far advanced, as to make it absolutely necessary to secure the ships every night from ten till two o'clock, the weather being too dark during that interval to allow of our keeping under-way in such a navigation as this, deprived as we were of the use of the compasses. But, however anxious the hours of darkness must necessarily be under such circumstances, the experience of the former voyage had given us every reason to believe, that the month of September would prove the most valuable period of the year for prosecuting our discoveries in these regions, on account of the sea being more clear from ice at this time than at any other. Feeling, therefore, as I did, a strong conviction, that the ultimate accomplishment of our object must depend, in a great measure, on the further progress we should make this season, I determined to extend our operations to the latest possible period. 1819. Sept.

The wind having been fresh from the north-east during the night, we were this morning enclosed for a time by a quantity of loose ice drifting down upon us. No change could be perceived in the state of the ice to the westward till one P.M., when it appeared to be moving a little off the point. We therefore warped the ships out, and made sail with a light but favourable breeze. At eight P.M., however, having arrived at the point, and finding no passage open, we made the ships fast in a large bay in a floe, in sixty-five fathoms, at the distance of a mile and a half from the shore. I sent Lieutenant Beechey on shore to look round from the hills for open water to the westward, as well as to sound round some heavy masses of ice which were aground in-shore, and within which it would perhaps become expedient to secure the ships in case of necessity. He reported on his return, at ten P.M., that no clear water whatever could be seen along the land, the ice being compact, and close in to the shore, as far as a bold headland which now formed the western extreme of the island, and which was from four to five leagues distant from us. The ice aground in-shore was very close to the beach, which was steep-to, as our soundings in the offing indicated. Lieutenant Beechey found, however, a depth of from twelve to four fathoms within many of the masses; but as there was little or no room to swing within them, I preferred keeping the ships in their present Tues. 7.

1819. Sept. situation, while the ice remained quiet. I was the more induced to do so from the boldness of the beach, and the depth of the bay formed by the floe to which we were now secured, which circumstances seemed to render it more than probable, that the latter would take the ground long before the ships could come in contact with it. We saw to-day, for the first time, a herd of eight or nine animals, feeding near the beach, which, from their dark colour, we supposed to be musk-oxen; and the officers of the Griper killed two white hares (*Lepus Variabilis*). The "young" or "bay" ice formed during the night in all the sheltered places about the floe, and particularly in the bight in which we were lying, to the thickness of three-quarters of an inch; and the pools upon the floe were now almost entirely solid, affording the officers and men, during the time of our unavoidable detention, the usual healthy amusements of skating and sliding.

Wed. 8. On the morning of the 8th, there being no prospect of any immediate alteration in the ice, I directed the boats to be sent on shore from both ships, to endeavour to procure some game, as well as to examine the productions of this part of the island. On going to the mast-head, shortly after the boats had been despatched, I found that the bight of ice in which the ships were lying was not one floe, but formed by the close junction of two, so that our situation was by no means so secure as I had supposed; for this bight was so far from being a protection to us, in case of the ice driving on shore, that it would probably be the means of "nipping" us between the floes which formed it. I therefore determined on immediately removing the ships in-shore, and went in a boat to look out for a place for that purpose, there being no alternative between this and our returning some distance to the eastward, into the larger space of clear water which we had there left behind us. I found that a heavy piece of ice aground in twelve fathoms, at the distance of three hundred yards from the beach, would suit our purpose for the Hecla, and another, in ten fathoms, still nearer in-shore, was selected for the Griper. These masses were from twenty to thirty feet above the sea, and each about the length of the respective ships. The beach in this neighbourhood was so lined with ice of this kind, that it would not have been easy for a ship to have gone on shore in any part, there being generally from four to seven fathoms on the outside of it, while the inner part of each mass was literally upon the beach at low water. Some of the detached masses, at a little distance from the shore, must have accumulated very considera-

bly since they grounded, or else must have been forced up into their present situations by an enormous pressure from without; as some of those now aground in four or five fathoms would have drawn at least ten, if set afloat again*. 1819. Sept.

At four P.M., the weather being quite calm, the ships were towed inshore by the boats, and made fast in the places selected for them. Our parties from the shore returned with a white hare, several fine ptarmigans, a few snow-buntings, some skulls of the musk-ox, and several rein-deers' horns; but they were not fortunate enough to meet with either of the two latter animals. The island is here, as in the other parts on which we had landed, principally composed of sandstone, of which some spherical nodules, one of them as large as a nine-pounder shot, were brought on board. Several lumps of coal, which was here more abundant than we had yet found it, were also picked up, and were found to burn with a clear lively flame, like cannel coal, but without splitting and crackling in the same manner.

Impatient and anxious as we were to make the most of the short remainder of the present season, our mortification will easily be imagined at perceiving, on the morning of the 9th, not only that the ice was as close as ever to the westward, but that the floes in our immediate neighbourhood were sensibly approaching the shore. As there was no chance, therefore, of our being enabled to move, I sent a party on shore at day-light to collect what coal they could find, and in the course of the day nearly two-thirds of a bushel, being about equal to the Hecla's daily expenditure, was brought on board. Our sportsmen, who were out for several hours, could only procure us a hare, and a few ducks. Thurs. 9.

The wind was light from the southward and westward, with foggy weather, which was afterwards succeeded by snow, and the ice continued gradually to close on the shore till at length a floe came in contact with our berg, but with so little violence as to produce no sensible effect upon it. The loose and heavy pieces of ice found their way in, and surrounded the Hecla on all sides, but produced no pressure from which any danger was to be apprehended. Con-

* For want of some more appropriate name by which these masses of ice might be distinguished, we were always in the habit of calling them bergs, which indeed they exactly resemble, though comparatively of small dimensions, and evidently formed in a very different manner from those enormous ice-islands, which are met with in Baffin's Bay, but of which we saw none to the westward of Barrow's Strait.

1819. Sept. sidering our present detention so near the shore a good opportunity for observing the time and rise of the tides, I caused a pole to be fixed on the beach for this purpose, by which it was found to be high water at half-past four in the morning; and the tide ebbed till half-past ten. From this time till three quarters after four P.M., when it was again high water, the tide had risen two feet eight inches; so that, small as this tide is, it seems to be very regular. The direction of the stream of flood was, as usual, not so easy to determine, but I shall give the facts as they occurred. At the time of low water by the shore, and for an hour and a quarter before it took place, the current was setting to the eastward, at the rate of three quarters of a mile per hour. It continued to run thus for the greater part of the day, but at times it was observed to set in the opposite direction, and now and then no current whatever was perceptible. From eight till eleven P.M., it was running strong to the westward, after which it stopped, and then began to set the ice the contrary way. I have been thus minute in mentioning the above particulars, not with a hope of throwing any light upon the interesting question of the direction of the tides in this part of the Polar Sea, but to shew how impossible it is, with the land close to us on one side, and on the other innumerable masses of ice in almost constant motion, to arrive at any satisfactory conclusion on this subject.

Frid. 10. It was nearly calm on the 10th, with thick snowy weather, which prevented our seeing to any great distance round us. At five A.M., a floe coming from the westward, ran against the berg, within which the Hecla was still secured, turning it round as on a pivot. This occurrence is not an uncommon one in Davis' Strait, with bergs of very large size, when the centre part of them only happens to be upon the ground. We were by this time so surrounded by ice that no clear water was to be seen, except the small pool in which we lay; and all that could be done, under such circumstances, was to watch the motion of the ice, and to be ready to shift the ship quickly round the berg, according as the floes, by setting one way or the other, might endanger her being "nipped." In the afternoon the ice slackened a little near us, when an attempt was made to get the Hecla into a more secure birth in-shore; but, after heaving a heavy strain occasionally for several hours, we could only succeed before dark in getting her into a small nook near the beach, in which, if no very violent pressure occurred, she might be tolerably secure during the night. A party returned in the evening from a shooting-excursion to the western cape, bringing with them only three hares, and reporting that the sea was entirely covered with ice as far as they could see to the westward from the hills.

Mr. Fisher made an experiment on the specific gravity of a piece of ice, taken from the mass to which the ship was secured. Being formed into a cube, whose sides measured one foot three inches and a half, and set to float in the sea, two inches and three quarters of it remained above the surface, the temperature of the water at the time being 31°. 1819. Sept.

On the 11th there was no alteration in the ice near the ships, and Mr. Bushnan, whom I despatched at day-light to the western cape, reported, on his return, that appearances were equally unpromising in that quarter. Mr. Dealy was fortunate enough to kill the first musk-ox that our sportsmen had yet been able to get near; but, as it was at the distance of eight or ten miles from the ships, our present situation, with regard to the ice, would not allow of my sending a party of men to bring it on board. A piece of the meat which Mr. Dealy brought with him was considered to taste tolerably well, but its smell was by no means tempting. The dip of the magnetic needle, observed here by Captain Sabine to-day, was 88° 36′.95. Sat. 11.

The wind increased to a fresh gale from the northward during the night, and on the morning of the 12th flew round to the N.N.W. in a very violent gust. Soon after the ice began to drift past us to the eastward, at the rate of a mile an hour, and carried away with it the berg to which the Hecla had been attached on the 9th and 10th; so that we considered ourselves fortunate in having moved to our present birth, which was comparatively a safe one. The Griper remained also tolerably secure, and well sheltered from the drifting ice, which in the course of the forenoon, had acquired a velocity of more than a mile and a half per hour. In the afternoon the ice began by degrees to drift from the shore to the westward of us, but the wind blowing hard from the wrong quarter, it was impossible to think of moving the ships. A constant and vigilant look-out was also necessary, lest the berg to which our hawsers were secured should be forced off the ground, in which case we must inevitably have been driven back many miles to the eastward, and the labour of the last ten days would have been lost in a few hours. The night was cold and inclement, with a heavy fall of snow, which being blown among the hills, caused great drifts in the ravines, by which this part of the island is intersected. Sun. 12.

I must now mention an occurrence which had caused considerable apprehension in our minds for the two last days, and the result of which had nearly proved of very serious importance to the future welfare of the expedition. Early on the morning of the 11th I received a note from Lieutenant Liddon, acquainting me that, at day-light the preceding day, Mr. Fife, with a party of

1819. Sept. six men, had been despatched from the Griper, with the hope of surprising some rein-deer and musk-oxen, whose tracks had been seen in a ravine to the westward of the ships. As they had not yet returned, in compliance with the instructions given to Mr. Fife, and had only been supplied with a small quantity of provisions, it was natural to apprehend that they had lost their way in pursuit of game, more especially as the night had been too inclement for them to have voluntarily exposed themselves to it. I therefore recommended to Lieutenant Liddon to send a party in search of his people, and Messrs. Reid, Beverly, and Wakeham, who immediately volunteered their services on the occasion, were accordingly despatched for this purpose. Soon after their departure, however, it began to snow, which rendered the atmosphere so extremely thick, especially on the hills along which they had to travel, that this party also lost their way in spite of every precaution, but fortunately got sight of our rockets after dark, by which they were directed to the ships, and returned at ten o'clock, almost exhausted with cold and fatigue, without any intelligence of the absentees.

At day-light on the following morning I sent Lieutenant Hoppner, with the Hecla's fore-royal-mast rigged as a flag-staff, which he erected on a conspicuous hill four or five miles inland, hoisting upon it a large ensign, which might be seen at a considerable distance in every direction. This expedient occurred to us as a more certain mode of directing our absentees towards the ships than that of sending out a number of parties, which I could not, in common prudence, as well as humanity, permit to go to any great distance from the ships; but the snow fell so thick, and the drift was so great, during the whole of the 12th, that no advantage could at that time be expected from it, and another night came without the absent party appearing.

Mon. 13. Our apprehensions on their account had by this time increased to a most painful degree, and I therefore ordered four parties, under the command of careful officers, to be prepared to set out in search of them the following morning. These parties carried with them a number of pikes, having small flags attached to them, which they were directed to plant at regular intervals, and which were intended to answer the double purpose of guiding themselves on their return, and of directing the absent party, should they meet with them, to the ships. For the latter purpose a bottle was fixed to each pike, containing the necessary directions for their guidance, and acquainting them that provisions would be found at the large flag-staff on the hill. Our searching parties left the ships soon after day-light, the

wind still blowing hard from the westward, with incessant snow, and the thermometer at 28°. This weather continued without intermission during the day, and our apprehensions for the safety of our people were excited to a most alarming degree, when the sun began to descend behind the western hills, for the third time since they had left the ship; I will not, therefore, attempt to describe the joyful feelings we suddenly experienced, on the Griper's hoisting the signal appointed, to inform us that her men, or a part of them, were seen on their return. Soon after we observed seven persons coming along the beach from the eastward, who proved to be Mr. Nias and his party, with four out of the seven men belonging to the Griper. From the latter, consisting of the corporal of marines and three seamen, we learned that they had lost their way within a few hours after leaving the ship, and had wandered about without any thing to guide them till about ten o'clock on the following day, when they descried the large flag-staff, at a great distance. At this time the whole party were together; but now, unfortunately, separated, in consequence of a difference of opinion respecting the flag-staff, which Mr. Fife mistook for a smaller one that had been erected some days before at a considerable distance to the eastward of our present situation; and, with that impression, walked away in a contrary direction, accompanied by two of his men. The other four who had now returned, (of whom two were already much debilitated,) determined to make for the flag-staff. When they had walked some distance and were enabled to ascertain what it was, one of them endeavoured to overtake Mr. Fife, but was too much fatigued, and returned to his comrades. They halted during a part of the night, made a sort of hut of stones and turf to shelter them from the weather, and kindled a little fire with gunpowder and moss to warm their feet; they had never been in actual want of food, having lived upon raw grouse, of which they were enabled to obtain a quantity sufficient for their subsistence. In the morning they once more set forward towards the flag-staff, which they reached within three or four hours after Lieutenant Beechey had left some provisions on the spot: having eaten some bread, and drank a little rum and water, a mixture which they described as appearing to them perfectly tasteless and clammy, they renewed their journey towards the ships, and had not proceeded far when, notwithstanding the snow which was constantly falling, they met with footsteps which directed them to Mr. Nias and his party, by whom they were conducted to the ships.

1819. Sept.

The account they gave us of Mr. Fife and his two companions, led us to

1819. Sept. believe that we should find them, if still living, at a considerable distance to the westward, and some parties were just about to set out in that direction, when the trouble and anxiety which this mistake would have occasioned us were prevented by the arrival of another of the searching parties, with the information that Mr. Fife and the two men were on their way to the ships, being about five miles to the eastward. Some fresh hands were immediately sent to bring them in, and they arrived on board at ten P.M., after an absence of ninety-one hours, and having been exposed, during three nights, to the inclemency of the first wintry weather we had experienced. Almost the whole of this party were much exhausted by cold and fatigue, and several of them were severely frost-bitten in their toes and fingers; but, by the skill and unremitted attention of our medical gentlemen, they were in a few days enabled to return to their duty.

Before midnight we had still greater reason than ever to be thankful for the opportune recovery of our people; for the wind increased to a hard gale about half-past eleven, at which time the thermometer had fallen to 15°; making altogether so inclement a night, as it would have been impossible for them, in their already debilitated state, to have survived. In humble gratitude to God for this signal act of mercy, we distinguished the headland to the westward of the ships, by the name of CAPE PROVIDENCE.

Tues. 14. Soon after midnight, the land-ice which was interposed between the Hecla and the beach, and to which the ship was partly secured, broke adrift, and floated off the ground; fortunately, however, we were prepared to cut the shore hawsers, by which means we avoided the danger of being carried off the shore, being well secured to the little berg a-head of us, which appeared to be firmly aground in ten fathoms' water. The stream cable was afterwards taken to the beach, and I determined, should the berg go adrift, to cut away our hawsers from it; and, having checked the ship by the stream-cable till she swung into five fathoms, at the distance of forty or fifty yards from the shore, to let go a bower anchor, till the wind should moderate. I communicated my intention to Lieutenant Liddon during the day, and directed him, in case of necessity, rather to run the Griper on the soft beach near us, than to risk being driven back to the eastward. Fortunately, however, it was not necessary to resort to this measure, as the ice held fast on the ground, notwithstanding the violence of the wind, and some sea which got up from the westward, as the space of open water between the land and the ice increased in that direction. At three A.M. this morning, the thermometer

had been as low as 9°, and rose gradually to 17°, at midnight. The sudden and unexpected decrease in the general temperature of the atmosphere about this period was a very striking one; and from this time, as will appear by the Meteorological Register, the commencement of winter may fairly be dated. 1819. Sept.

Our flag-staves we brought on board early in the morning of the 15th, and at ten A.M., the wind being somewhat more moderate, the stream-cable was cast off from the shore, in readiness for making sail; but the wind freshened up once more to a strong gale, which rendered it necessary still to hold on by our hawsers. In the evening the stream-cable was taken on shore again, and we landed to make observations for the variation of the needle, which was found to be 117° 52′ 22″ easterly. Wed. 15.

It was observed, for the first time, that a strong current was setting to the westward during the whole of the last night, directly against a fresh gale from that quarter. At nine A.M., the wind being much more moderate, as well as more off the land, and the weather fine and clear, we cast off, and made all sail to the westward, running along the land at the distance of two or three miles from it. At a quarter before noon, we were abreast of Cape Providence, beyond which, at the distance of three or four leagues, another headland, still more high and bold in its appearance, was discovered, and named after Mr. Hay, Private Secretary to the First Lord of the Admiralty. At the place which we left in the morning, the ice had been driven from the shore to the distance of six or seven miles; but we found, as we proceeded, that the channel became gradually more and more contracted, till at length the ice was observed to extend, in a solid and impenetrable body, completely in to the very shore, a little to the eastward of Cape Hay. Our latitude, by account at noon, was 74° 23′ 25″, longitude 112° 29′ 30″. Thur. 16.

The wind again freshened to a strong gale in the afternoon, reducing us to our close-reefed topsails, which were as much as the ship would bear, the squalls blowing out of the ravines with extreme violence. It became necessary, therefore, to look out for a secure situation for the ships during the ensuing night, which threatened to be a tempestuous one; but no such situation presented itself in this neighbourhood; the whole of the coast to the westward of Cape Providence being so steep, that the heaviest ice can find no ground to rest upon. I was therefore reduced to the disagreeable necessity of running back to the lower shore three miles and a half to the eastward of Cape Providence, where alone the ships could, under present circumstances, be

1819. Sept. placed in tolerable security during six or seven hours of darkness. We found here twenty-three fathoms at three hundred yards from the shore, and had fifteen under our stern, at the distance of one hundred and fifty yards. As it was nearly dark before the Griper arrived, when it is difficult to secure a ship to the ice, Lieutenant Liddon found it necessary to run into four fathoms, at one hundred yards from the beech, and there to drop his bower anchor. At half-past ten P.M., a large mass of ice, which had been aground near us, was set afloat by the swell and drifted off shore. A strong westerly current, which was still running to windward, set this ice across our stern, and occasioned the ship to strike violently several times upon a "tongue" projecting from it under water: the shocks exactly resembled those of a ship striking the ground, and the rudder was forcibly lifted two or three times, but fortunately without receiving any damage. I afterwards learned from Lieutenant Liddon, that a great quantity of the land-ice had been drifting off in large pieces during the night near the spot where the Griper had anchored, keeping her crew employed for several hours in veering and heaving in cable, in order to avoid it.

Frid. 17. At nine A.M. on the 17th, the wind being more moderate and the weather fine, we cast off and ran along the land; but had not proceeded far when it was perceived that the ice, in very heavy and compact floes of more than usual dimensions, still extended close into the shore near Cape Hay. We observed, at noon, in latitude 74° 22′ 15″, our longitude, by account, being 112° 51′; and, in the afternoon, stood close in to the high land, which here gives the island a new character, and tacked in forty-three fathoms, at the distance of five hundred yards from the shore. Further out we obtained no soundings; indeed I deemed it so essential to make the most of the day-light in examining the state of the ice to the westward, that I did not choose to heave-to for that purpose; but the appearance of the land, and the soundings found in-shore, indicate a considerable depth of water on this part of the coast.

The current which, for the last two days, had been setting to the westward, and which could not possibly have escaped our observation, had it existed previous to the late westerly and north-westerly gales, was here found to be running even stronger than we had before remarked it. This was made particularly obvious when, having reached the farthest point westward, to which we could prudently venture to carry the ships, we were obliged to heave-to, in order to watch for any opening that might favour our views. The ships

were at this time drifting to leeward through the water at the rate of about a mile and a quarter an hour; in spite of which they went so fast to the westward by the land, that Lieutenant Beechey and myself estimated the current to be running at least two miles per hour in that direction. I must here remark that, besides the current to which I have now alluded, and by which the floes and other *heavy* masses of ice appeared to be affected, there was as usual in this navigation, a superficial current also, setting the smaller pieces past the others at a much quicker rate. In the course of this narrative, I shall have frequent occasion to remark, how, immediately after the springing up of a breeze, such a current generally commences running upon the surface in the Polar seas. 1819. Sept.

Of the causes which now produced this strong westerly current, at a time when the contrary might rather have been anticipated, it is of course not easy, with our present limited experience of this part of the Polar Sea, to offer any very probable conjecture; but the impression upon our minds at the time was, that it was perhaps caused by the re-action of the water, which had been forced to the eastward in the early part of the late gales, against the ice with which the sea was almost entirely covered in that direction. Be this as it may, however, we did not fail to draw from it one conclusion, which was favourable to the object we had in view; namely, that the drift of so large a body of ice for days together in a westerly direction, indicated a considerable space of open sea somewhere in that quarter. I was, on every account, therefore, desirous to take advantage of a current which was setting us so fast in the desired direction, and, with that view, had come to the determination to anchor the ships to an immense field of ice, over which we could not see from the mast-head, and of which the thickness was greater than any I had ever before seen; by which means we were in hopes of making some progress, notwithstanding the unfavourable appearances before us. Ere this could be effected, however, it was perceived that the main body of the ice was not only setting to the westward, but was also rapidly approaching the shore; so that it was impossible to adopt the proposed measure, without incurring the serious risk of being enclosed between them. Finding that no further progress could possibly be made at present, and the wind again freshening up from the westward, with heavy squalls of snow, I was once more under the necessity of returning to the eastward till some land-ice could be met with, to which the ships might be secured for the night. They were

1819. Sept. accordingly made fast in a proper birth of this kind, not far from that which we had occupied the preceding night, in fifteen fathoms' water, and at a hundred and fifty yards from the beach.

I entertained a hope that our people, and especially the Griper's crew, who were still much reduced by the effects of their late sufferings and fatigues, would have been allowed a good night's rest, of which they stood much in need, in order to prepare them for fresh exertions in the morning; but, at eight P.M., while it was fortunately yet light enough to see about us, it was perceived that a large floe to the south-east had very much neared the shore since we anchored, rendering it necessary immediately to leave our present situation, where there was not a single mass of grounded ice on the outside to afford the smallest shelter to the ships. I determined, therefore, to stand back to the eastward, and as the night was, for the first time this fortnight past, very fine and moderate, to keep the ships under way, and to regulate our course, in the best manner we could, by the stars. We had at this time a fine working breeze off the land, but it gradually died away towards midnight, after which the "young" ice began to form so rapidly on the surface of the sea, that we could scarcely get the ships to move through the water; and at six A.M.
Sat. 18. on the 18th, when we were within a quarter of a mile of the shore, their way was altogether stopped. The current was still running so fast to the westward, that we were now swept back along the land at the rate of a mile and a quarter per hour. An attempt was, therefore, made to run a line to the shore, but the "young" ice had become so "tough," that the boats could not succeed in getting through it, while at the same time it was much too weak to allow of their being hauled over it, not exceeding an inch in thickness. As the main body of the ice to the southward of us was now perceived to be in motion towards the shore, it became essential to the safety of the ships that they should be got in to the beach in order to secure them, if possible, within the land ice; and, as the current was now rather carrying us into deeper water, I directed the ships to be anchored, as the only means of retaining them in their present situation till the lines could be run out to the shore. As soon as we had anchored, a second attempt was made to effect this, but with as little success as before, and we were very glad to get the boats on board again, the young ice having nearly carried them away from us to the westward. As the day advanced, however, this ice became gradually thinner and less continuous; so that, after much unavailing labour, we at length succeeded in getting a hawser to the beach, by watching the little openings, and taking the

opportunity of pushing the boats through them. All the hands which now remained on board the Hecla were occupied in weighing the anchor, a service which we could not possibly have mustered strength enough to perform, but for the cheerfulness and zeal with which the officers volunteered on this, as on various other occasions, to man the capstan. Having at length, with much difficulty, effected this, we were beginning to haul the ship in towards the beach, when the wind shifted to the south-west, which is rather upon this shore. It was uncertain what change this might produce in the motion of the floes, which seemed to be enclosing us rapidly on every side, and as the bay-ice had now nearly disappeared, it was considered advisable to make sail upon the ships, so as to be ready to take advantage of any alteration that might occur. I sent to Lieutenant Liddon to desire, that, in case of the ice closing upon us, and of his being unable to find a proper security for the Griper within the grounded ice, he would at once run her bow upon the softest part of the beach, so that the floes might, perhaps, force her up without much damage; whereas it would be attended with almost certain destruction to the ships, should they be caught between the floes and the heavy masses of ice with which this beach was, for the most part, lined. 1819. Sept.

By the time that we had made sail, the ice had completely surrounded us touching the land to the eastward as well as to the westward, and leaving us only a small pool of open water, in which we were at liberty to beat about. To the eastward, however, we could perceive from the crow's nest, that there was still a considerable channel of clear water, and our only chance of getting into it was by narrowly watching for any opening that might occur in the ice which now opposed a formidable barrier to our escape in that direction. At half-past one P.M., it was observed that a floe, which formed the principal obstruction to our progress eastward, and which the current was rapidly carrying along the shore, had at length come violently in contact with a small point of land near us, and was now receding from it by its own re-action. We stood towards this opening, in order to observe it more distinctly, and I hailed the Griper to desire Lieutenant Liddon to be in readiness to make sail, should it appear sufficiently broad for our purpose. On approaching this spot, we found the passage about three hundred yards wide between the land and the ice; and as there was no time either for deliberation or for sounding the channel, all the studding-sails were instantly set in both ships, and we pushed through the opening at the distance of a hundred yards from the beach, having no less than ten fathoms' water.

1819. Sept. It was impossible not to consider ourselves fortunate in having escaped the danger which had lately threatened the ships; but another difficulty now presented itself which we had not anticipated. This was occasioned by finding nearly the whole surface of that part of the sea, which at a distance had appeared to us open, covered with a coating of young ice of sufficient thickness to offer a considerable impediment to the ships, when sailing with a strong and favourable breeze. To give some idea of the degree of obstruction occasioned by this ice, whose thickness did not generally exceed half an inch, it may be sufficient to state, that with such a quantity of sail as would certainly have propelled the Hecla six miles and a half an hour, if unimpeded in this way, she did not average more than four miles. This remark must be understood to apply to ice of this kind, when of a single thickness, and in the state in which it is naturally formed upon the surface. But, whenever, by any pressure on either side, the sheet is broken, and the edges of one part forced under those of another, causing them to overlay each other, the whole thickness of the ice is of course augmented, and the impediment to a ship becomes greater in proportion to the frequency with which this occurs. Where this has taken place, the ice, being too thick to allow the water to be seen through it, is distinguished by the whiteness of its appearance; the white ice, therefore, is to be avoided in sailing, as much as possible.

It was my intention, as usual with us of late, to sail along the shore till we came to any land-ice calculated to afford shelter to the ships during the night. As we ran along, however, it was soon perceived that the main body of the ice was very rapidly approaching the shore, at the same time that the westerly current was still carrying in that direction; the ships were immediately hauled in-shore, to find the best security against it which circumstances would admit, but the bay-ice had in this place become so thickened by the continued pressure of the floes upon it from without, that the ships were shortly arrested in their progress, being about one mile distant from the land. Every expedient to break the ice, usual in such cases, was resorted to, without our being able to move the ships a single foot a-head. The floe continued rapidly closing on the shore, forcing the ships in before it, and bringing with it so much of the bay-ice, that it was needless any longer to employ the people in attempting to break it: to anchor seemed now the only mode we had left to avoid being driven on shore, or, what was much more to be apprehended, being forced by the floes against the heavy ice on the beach. We waited, therefore, till at seven P.M. we had shoaled

the water gradually from twenty-nine to nine fathoms, and then dropped the bower-anchor. When the ship swung in-shore by the continued pressure of the ice, we had still seven fathoms under the stern, our distance from the beach being about forty yards. We now seemed to have got rather within the drift of the main body of ice, which passed us to the westward at the rate of two miles an hour; but, at length, the point of a large field, which had hitherto not approached the shore nearer than two or three hundred yards, was observed to be rapidly nearing us. Immediately to the westward of the spot where the Hecla's anchor had been dropped, some very heavy ice, which, for distinction's sake, we called a berg, projected from the beach to the distance of a hundred and fifty yards. The ships had fortunately been forced by the ice, one on each side of this projecting point; for at eight P.M. the field came in contact with it with a tremendous crash, piling up the enormous fragments of ice in the most awful and terrific manner; this seemed to break, in some degree the force with which the ice had been driving; a force which may almost be considered incalculable, as we could not see over the field in motion from our mast-head. We were at this time within a hundred yards of the point, and had, therefore, great reason to be thankful for having escaped being carried into a situation in which no human power or skill could have saved the ships from instant destruction. 1819. Sept.

As the pressure of the bay-ice around the ship continued to increase, she was carried gradually in towards the shore, and as nothing was now to be expected but her being driven on the beach, I ordered the rudder to be lifted, the sails to be furled, and the top-gallant yards to be ready for striking. At half-past eight P.M., the Hecla had tailed into three fathoms and a half, about fifteen yards from the beach. The quantity of bay-ice which was squeezed up between the ship and the shore had by this time become so great, that it would easily bear the boats and the men, the former of which were hauled over the ice to enable us to hoist them up. It seemed also to serve the useful purpose of a fender to keep the ship off the ground, which she did not appear to touch in any part.

In the meantime, the Griper had been carried into a situation nearly similar to ours, on the opposite side of the berg, by which she was partly hidden from our view. We observed her heel over very much at times, but knowing that a very trifling pressure was with her sufficient to produce this effect, little apprehension was entertained on that account. I subsequently

ASIATIC SOCIETY MUMBAI

Drawn & Engraved by W. Westall, A.R.A. from a Sketch by Lieu.t Beechey.

Situation of H. M. S. Hecla & Griper.

Sept.r 20.th 1819.

Published by John Murray, London, March 6 1821.

1819. Sept. learned from Lieutenant Liddon, that when the field of ice closed upon us, a point of it had caught the Griper's chain-cable, by which the anchor was immediately started, and the vessel carried towards the shore. The cable was dragged out so swiftly, that it could not be slipped, and, in a few minutes, the space between the two hawse-holes was completely cut through. The cable parted soon after, and the other anchor being let go, brought the ship up in time to prevent her going on shore. The Griper also lost one of her boats on this occasion, but was fortunate in sustaining no material injury.

At nine P.M., the ice moved a few hundred yards off the land, and the opportunity was taken to heave the Hecla into a little nook, formed by the grounded ice, where we lay without disturbance during the night. The officers and men were much fatigued by this day's exertions, and I directed the main brace to be spliced, and an extra-allowance of preserved meat to be served.

Sun. 19. At day-light, on the 19th, the field-ice had drifted about a mile from the land, the intermediate space being almost entirely occupied by innumerable loose fragments cemented together by bay-ice, so as to form one connected and impenetrable body. The weather was nearly calm with continued snow, and the ice remained tolerably quiet during the day.

Mon. 20. Early on the morning of the 20th, the breeze freshened up from the N.N.E., and soon after four A.M., the ice began to open out from the shore. It did not, however, take a direction immediately off the land, though the wind was nearly so, for there was still a current which carried the floes to the westward; and some of the projecting points came very near the land. Some of these missed the Hecla by about a hundred yards; but at half-past eight, one of them was observed to be moving directly into the bight where the Griper was lying. In a few minutes after this, we perceived her to heel so much, that no doubt could be entertained of her having been forced on shore by the ice. Having sent Mr. Palmer round by land to inquire what was her situation, I was informed that she was aground on the beach, having only seven feet water on the inside, and the ice still continuing to press upon her from without. I therefore consulted my officers as to the measures it would, under these circumstances, be most prudent to adopt, and despatched Lieutenant Beechey round to the Griper, to explain my intentions to Lieutenant Liddon. I proposed, if the Griper required lightening considerably before she could be hove off, an operation which, in her present

situation, it would require some time to perform, to get the Hecla, as quickly as possible, into the first place of security we could find, and then to march all hands round to the Griper, for the purpose of getting her afloat. 1819. Sept.

Shortly after our leaving England, Lieutenant Liddon had been unfortunately attacked with a severe rheumatic complaint, which confined him to his cabin during our passage across the Atlantic, but of which he so far recovered, soon after our making the ice in June, as to be able constantly to attend to his duty on deck during the rest of the summer. The harassing circumstances, however, which had attended our exertions for the last fortnight, and the sensible change which had lately taken place in the temperature of the atmosphere, had combined to produce a serious alteration for the worse; so that at the time of the Griper's being driven on shore, he was again reduced to a very debilitated state. On this account I proposed to him to allow himself to be removed on board the Hecla, until the Griper should be got afloat again. To this proposal, however, he would by no means listen, assuring me, that he should be the last man, instead of the first, to leave the Griper; and he remained seated against the lee side of the deck during the greater part of the day, giving the necessary orders.

The wind continuing strong from the northward, the ice left the shore very rapidly in the afternoon, so that, by one P.M., there was once more a little clear water about the ships. Before Lieutenant Beechey left the Griper, they had been enabled to get the hawl-head down on the sea-side of the vessel, where they found between fifteen and sixteen feet water; and, as the tide was now rising, we began to entertain great hopes of her coming off the shore without difficulty or damage. Soon after noon we perceived that she had righted considerably, and at two P.M., we were informed by telegraph that she was afloat. A party of our hands was sent on board to assist in making her snug, that she might be ready for moving whenever the ice would permit. The wind blew hard from the northward during the night, with a good deal of snow; and the thermometer was at $10\frac{1}{2}^{\circ}$ at midnight. The Aurora Borealis was seen faintly in the S.S.W. quarter of the heavens.

The advanced period of the season, the unpromising appearance of the ice to the westward, and the risk to the ships with which the navigation had been attended for some days past, naturally led me to the conclusion that, under these circumstances, the time had arrived, when it became absolutely necessary to look out for winter-quarters. Among the circumstances

1819. Sept. which now rendered this navigation more than usually perilous, and the hope of success proportionally less, there was none which gave more reasonable ground for apprehension than the incredible rapidity with which the young ice formed upon the surface of the sea, during the greater part of the twenty-four hours. It had become evident, indeed, that it could only be attributed to the strong winds which had lately prevailed, that the sea was not at this time permanently frozen over; for, whenever the wind blew less than a gale, that formation took place immediately, and went on with such astonishing rapidity, that had the weather continued calm for more than four-and-twenty hours together, it seemed to me extremely probable, that we must have passed the winter in our present exposed and insecure situation.

From this and various other considerations, which the account of our late proceedings will naturally suggest, I considered it a duty incumbent upon me to call for the opinions of the senior officers of the expedition, as to the expediency of immediately seeking a harbour, in which the ships might securely lie during the ensuing winter. The opinions of the officers entirely concurring with my own, as to the propriety of immediately resorting to this measure, I determined, whenever the ice and the weather would allow, to run back to the Bay of the Hecla and Griper, in which neighbourhood alone we had any reason to believe that a suitable harbour might be found.

Tues. 21. It blew a hard gale from the northward during the night, by which means the floes were kept at a distance from the land, and by the bay-ice prevented from forming under the lee of it. The sea to the eastward was not, however, sufficiently clear, nor the wind moderate enough during the 21st, to allow us to move the ships. The land was now almost entirely covered with snow, and, as we afterwards found, remained so during the winter. A few coveys of the ptarmigan were seen near the beach during the time that we remained at this station.

Wed. 22. At half-past two, on the morning of the 22d, the night-signal was made to weigh, and we began to heave at our cables; but such was the difficulty of raising our anchor, and of hauling in our hawsers, owing to the stiffness of the ropes from frost, and the quantity of ice which had accumulated about them, that it was five o'clock before the ships were under way. Our rudder also was so choked by the ice which had formed about it, that it could not be moved till a boat had been hauled under the stern, and the ice beaten and cut away from it. We run along to the eastward without any obstruction, in a channel about five miles wide, till we were within four or

five miles of Cape Hearne, where the bay-ice, in unbroken sheets of about one-third of an inch in thickness, began to offer considerable impediment to our progress. We were abreast of the point at noon, and here our prospect was rather discouraging; the anchorage in the bay was quite free from any obstruction, but a space of three or four miles to the north-eastward of Cape Hearne, was completely covered with bay-ice, which made it more than probable that we should altogether be excluded from the roadstead. We entered this ice under a press of sail, the wind blowing strong from the northward, and found it to consist principally of that kind which, from its appearance, is technically called "pancake-ice," and which, though it considerably retarded our progress in beating to windward, did not offer so serious an impediment as we had expected. At half-past two P.M., in swinging the main-topsail-yard in stays, it was unfortunately carried away in the slings, but this accident was quickly repaired by the zealous exertions of the officers and men. As I saw that the Griper, which had dropped several miles astern in the course of the day, could not possibly reach the anchorage before dark, and being apprehensive that by a too anxious endeavour to effect that object, she might become frozen up at sea during the night, I made Lieutenant Liddon's signal to secure his ship to the grounded ice off Cape Hearne, which he accordingly did. Soon after the sun had set, I had reason to entertain the same apprehension for the Hecla; for the young ice began, as usual, to form upon the surface of the water, and in an hour's time offered so considerable a resistance to the ship's motion, though under a press of canvass, and with a fresh breeze, as to make it doubtful for some time whether we should reach the anchorage. We at length, however, struck soundings with twenty-nine fathoms of line, and at eight P.M. anchored in nine fathoms, on a muddy bottom, a little to the eastward of our situation on the 5th. 1819. Sept.

The wind continued northerly, with a heavy fall of snow during the night. At half-past six A.M. on the 23d, there being fortunately so little bay-ice that a boat could easily pull through it, I left the ship, accompanied by Mr. Nias, to examine Fife's harbour, which had been reported to me as affording good shelter, but having a bar across its entrance. I directed Lieutenant Beechey at the same time to get the Hecla under way, and to anchor wherever I should lay down a buoy for that purpose. My mortification may well be imagined at finding, on my arrival off Fife's harbour, that it was covered with one solid sheet of ice from six to twelve inches in thickness, Thur. 23.

1819. Sept. which had been entirely formed since our last visit to this place. I landed on the west side of the harbour, and being soon after joined by a boat from the Griper, which vessel was beating up from Cape Hearne, I was informed by Mr. Skene, that a second bay or harbour had been seen by the officers on the former occasion, a short distance to the westward of this. We lost no time, therefore, in rowing there, having first laid down a buoy, near which the Hecla was to anchor, and made the necessary signal to Lieutenant Beechey.

In going to the westward, we passed a shoal and open bay, immediately adjacent to the harbour which we were now about to examine, and soon after came to a reef of rocks, in some parts nearly dry, extending about three-quarters of a mile to the southward of a low point on the south-eastern side of the harbour. On rounding the reef, on which a quantity of heavy ice was lying aground, we found that a continuous floe, four or five inches in thickness, was formed over the whole harbour, which in every other respect, appeared to be fit for our purpose; and that it would be necessary to cut a canal of two miles in length through the ice, in order to get the ships into a secure situation for the winter. We sounded the channel into the harbour for about three-quarters of a mile, by making holes in the ice and dropping the lead through, and found the depth from five to six fathoms.

Having ascertained thus far, it remained for me to sound the bar of Fife's harbour, and then to choose between the two places. I returned on board, therefore, for the boats' crews to dine, and then proceeded in execution of this object. The entrance into Fife's harbour is extremely narrow, which enabled us the sooner to determine the utter impracticability of getting the ships into it, as we found the depth on the bar to be barely twelve feet at high water and a spring tide. I returned on board, therefore, and determined on taking the ships round the reef to the entrance of the westernmost harbour, on the following morning. A good deal of snow fell this evening, and the young ice formed on the surface after sun-set.

Frid. 24. The ships weighed at six A.M. on the 24th, the wind being still at north, and the weather moderate and fine. As soon as the Hecla was under sail, I went a-head in a boat to sound, and to select an anchorage for the ships. In running to the westward towards the point of the reef, we had no less than three fathoms and three quarters; and, by keeping farther off shore, we might have had much deeper water, but the wind being scant, it was necessary to keep well to the northward. Near the south-western point of this

ASIATIC SOCIETY MUMBAI

Drawn & Engraved by W. Westall A.R.A. from a Sketch by Lieut. Beechey.

The Crews of H. M. S. Hecla & Griper cutting into Winter Harbour.

Sept.r 26th 1819

ASIATIC SOCIETY MUMBAI

harbour there is a remarkable block of sandstone, somewhat resembling the roof of a house, on which the ships' names were subsequently engraved by Mr Fisher. This stone is very conspicuous in coming from the eastward, when kept open to the southward of the grounded ice at the end of the [illegible] a good leading mark for the channel into the harbour. Off the [illegible] reef the water deepened to six fathoms, and the Hecla's anchor [illegible] in eight fathoms, half a mile within the reef, and close to the [illegible] through which the canal was to be cut. The Griper arrived soon after, and by half-past eight A.M. both ships were secured in the proper position for commencing the intended operations. 1819. Sept.

As soon as our people had breakfasted I proceeded, with a small party of men, to sound, and to mark with boarding-pikes upon the ice, the most direct channel we could find to the anchorage; having left directions for every other officer and man in both ships to be employed in cutting the canal. This operation was performed by first marking out two parallel lines, distant from each other a little more than the breadth of the larger ship. Along each of these lines a cut was then made with an ice-saw, and others again at right angles to them, at intervals of from ten to twenty feet; thus dividing the ice into a number of rectangular pieces, which it was again necessary to subdivide diagonally, in order to give room for their being floated out of the canal. On returning from the upper part of the harbour, where I had marked out what appeared to be the best situation for our winter-quarters, I found that considerable progress had been made in cutting the canal, and in floating the pieces out of it. To facilitate the latter part of the process, the seamen, who are always fond of doing things in their own way, took advantage of a fresh northerly breeze, by setting some boats' sails upon the pieces of ice, a contrivance which saved both time and labour. This part of the operation, however, was by far the most troublesome, principally on account of the quantity of young ice which formed in the canal, and especially about the entrance, where, before sun-set, it had become so thick that a passage could no longer be found for the detached pieces, without considerable trouble in breaking it. At half past seven P.M. we weighed our anchors, and began to warp up the canal, but the northerly wind blew so fresh, and the people were so much fatigued, having been almost constantly at work for nineteen hours, that it was midnight before we reached the termination of our first day's labour. While we were thus employed, about nine o'clock a vivid flash of light was observed, exactly like lightning. There was at the same time, and during the

1819. Sept. greater part of the night, a permanent brightness in the northern quarter of the heavens, which was probably occasioned by the Aurora Borealis. I directed half a pound of fresh meat per man to be issued, as an extra allowance; and this was continued daily till the completion of our present undertaking.

Sat. 25. All hands were again set to work on the morning of the 25th, when it was proposed to sink the pieces of ice, as they were cut, under the floe, instead of floating them out, the latter mode having now become impracticable on account of the lower part of the canal, through which the ships had to pass, being hard frozen during the night. To effect this, it was necessary that a certain number of men should stand upon one end of the piece of ice which it was intended to sink, while other parties, hauling at the same time upon ropes attached to the opposite end, dragged the block under that part of the floe on which the people stood. The officers of both ships took the lead in this employ, several of them standing up to their knees in water frequently during the day, with the thermometer generally at 12°, and never higher than 16°. At six P.M. we began to move the ships. The Griper was made fast astern of the Hecla, and the two ships' companies being divided on each bank of the canal, with ropes from the Hecla's gangways, soon drew the ships along to the end of our second day's work.

Sun. 26. I should, on every account, have been glad to make this a day of rest to the officers and men; but the rapidity with which the ice increased in thickness, in proportion as the general temperature of the atmosphere diminished, would have rendered a day's delay of serious importance. I ordered the work, therefore, to be continued at the usual time in the morning; and such was the spirited and cheerful manner in which this order was complied with, as well as the skill which had now been acquired in the art of sawing and sinking the ice, that, although the thermometer was at 6° in the morning, and rose no higher than 9° during the day, we had completed the canal at noon, having effected more in four hours than on either of the two preceding days. The whole length of this canal was four thousand and eighty-two yards, or nearly two miles and one-third, and the average thickness of the ice was seven inches.

At half-past one P.M. we began to track the ships along in the same manner as before, and at a quarter past three we reached our winter-quarters, and hailed the event with three loud and hearty cheers from both ships' companies. The ships were in five fathoms' water, a cable's length from the beach on the north western side of the harbour, to which I gave the name of WINTER HARBOUR; and I called the group of islands which we had discovered in the

Polar Sea NEW GEORGIA; but having afterwards recollected that this name is already occupied in another part of the world, I deemed it expedient to change it to that of the NORTH GEORGIAN ISLANDS, in honour of our gracious Sovereign, GEORGE THE THIRD, whose whole reign had been so eminently distinguished by the extension and improvement of geographical and nautical knowledge, and for the prosecution of new and important discoveries in both. 1819. Sept.

ASIATIC SOCIETY MUMBAI

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *September*, 1819.

Day	Temperature of Air in shade.			Temperature of Sea Water at the Surface.	Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.		
	+ °	+ °	+ °	+ °	inches.	inches.	inches.		
1	36	31.5	33.00	31.8	29.99	29.63	29.77 5	N.W.	Light breezes and hazy, with small snow.
2	36	31	32.79	31.4	30.31	30.05	30.212	S.W.bW.	Light airs and cloudy.
3	37	31	34.17	32.5	30.42	30.31	30.377	N.W.	Light airs and hazy.
4	35	28	31.83	31.9	30.37	30.31	30.340	N.W.bN.	Moderate breezes and cloudy.
5	32	28.5	30.58	31.8	30.31	30.21	30.245	N. N. E.	Fresh breezes and cloudy, with snow.
6	30	25	27.96	30.2	30.18	30.14	30.155	North.	Fresh breezes and cloudy.
7	30	25	28.42	29.8	30.12	30.10	30.110	N.N.E.	Moderate breezes and cloudy.
8	31	28	30.00	30.0	30.09	30.07	30.085	{ A.M. N.E. P.M. S.W. }	Light breezes and hazy.
9	32	29	30.67	30.5	30.11	30.04	30.072	S.W.	Light breezes and cloudy.
10	32	30	31.00	30.9	30.10	30.51	30.075	Round the Compass.	Light airs and hazy, with snow.
11	30	26	27.75	30.2	29.95	29.86	29.892	N.E.	Light breezes and cloudy, with snow.
12	30	28.5	29.50	30.2	29.80	29.73	29.769	S.W.	Fresh breezes and hazy, with snow.
13	29	15.5	26.08	29.2	29.62	29.41	29.537	W.S.W.	Fresh breezes and cloudy, with small snow.
14	17	9	13.79	28.3	29.77	29.57	29.710	W·N.	Strong gales and squally.
15	21.5	16	18.92	28.8	29.80	29.72	29.762	N.W.bW.	Fresh breezes and clear.
16	24	17	21.25	29.5	29.70	29.57	29.644	W.N.W.	Strong breezes,—squalls at times
17	22	16.5	19.75	29.2	30.07	29.72	29.890	W.N.W.	Fresh breezes and squally.
18	29	20	23.67	29.0	30.00	29.90	29.950	N.N.W. to S.W.b.W.	Light variable breezes and cloudy.
19	25	19	29.83	29.0	29.75	29.47	29.617	S.W.	Light breezes and cloudy, with snow.
20	21	10.5	17.25		29.46	29.36	29.412	N.N.E.	Strong breezes and hazy.
21	19.5	10	15.83		29.60	29.43	29.510	North.	Strong gales and cloudy.
22	23	17	19.67		29.62	29.54	29.580	N.bW.	Strong breezes and squally.
23	23	20	22.08		29.80	29.66	29.742	North.	Fresh breezes and cloudy, with snow.
24	24	9	20.25		30.04	29.80	29.935	N.N.W.	Moderate and cloudy, snow at times.
25	17	7	13.58		30.14	30.04	30.100	North.	Moderate breezes and cloudy.
26	8	—1	5.00		30.19	30.17	30.175	N.N.W.	Moderate breezes and fine.
27	21	+5	15.00		30.14	30.01	30.092	{ A. M. N.N.W. P. M. N.N.E. }	Moderate breezes and hazy.
28	23	10	17.33		29.98	29.88	29.925	N.N.E.	Fresh breezes and hazy.
29	14	8	11.25		29.82	29.76	29.787	North.	Fresh breezes and cloudy.
30	7	4	5.92	29,3	29.87	29.70	29.788	North.	Strong breezes, with snow at times.
	+37	—1	+22.54		30.42	29.36	29.905		

CHAPTER V.

PRECAUTIONS FOR SECURING THE SHIPS AND STORES—FOR PROMOTING GOOD ORDER, CLEANLINESS, HEALTH, AND GOOD-HUMOUR, AMONG THE SHIPS' COMPANIES — ESTABLISHMENT OF A *THEATRE*, AND OF THE *NORTH GEORGIA GAZETTE*—ERECTION OF AN OBSERVATORY ON SHORE—COMMENCE OUR WINTER'S AMUSEMENTS—STATE OF THE TEMPERATURE AND VARIOUS METEOROLOGICAL PHENOMENA—MISCELLANEOUS OCCURRENCES TO THE CLOSE OF THE YEAR 1819.

HAVING now reached the station, where, in all probability, we were destined to remain for at least eight or nine months, during three of which we were not to see the face of the sun, my attention was immediately, and imperiously, called to various important duties; many of them of a singular nature, such as had, for the first time, devolved on any officer in His Majesty's navy, and might indeed be considered of rare occurrence in the whole history of navigation. The security of the ships, and the preservation of the various stores, were objects of immediate concern. A regular system to be adopted for the maintenance of good order and cleanliness, as most conducive to the health of the crews during the long, dark, and dreary winter, equally demanded my attention. 1819. October.

Not a moment was lost, therefore, in the commencement of our operations. The whole of the masts were dismantled except the lower ones, and the Hecla's main-top-mast, the latter being kept fidded for the purpose of occasionally hoisting up the electrometer-chain, to try the effect of atmospherical electricity. The lower yards were lashed fore and aft amidships, at a sufficient height to support the planks of the housing intended to be erected over the ships, the lower ends of which rested on the gunwale; and the whole of this frame-work was afterwards roofed over with a cloth, composed of

85367

1819. October. wadding-tilt, with which waggons are usually covered; and thus was formed a comfortable shelter from the snow and wind. The boats, spars, running rigging, and sails, were removed on shore, in order to give as much room as possible on our upper deck, to enable the people to take exercise on board, whenever the weather should be too inclement for walking on shore. It was absolutely necessary, also, for the preservation of our sa[illegible] all of which were hard-frozen, that they should be kept in that [illegible] return of spring; for, as it was now impossible to get the [illegible] owing to the constantly low temperature of the atmosphere, th[illegible] probably, have soon rotted had they been kept in any part of [illegible] here the warmth would occasion them to thaw; they were, therefore, p[illegible] with the boats on shore, and a covering of canvass fixed over them. This covering, however, as we afterwards found, might better have been dispensed with; for as we had not the means of constructing a roof sufficiently tight to keep out the fine snow which fell during the winter, it only served, by the eddy wind which it created, to make the drift about it greater; and, I have now no doubt that, with stores in the state in which I have described our sails to be, it would be better simply to lay them on some spars to keep them off the ground, allowing the snow to cover them as it fell. For want of experience in these matters, we also took a great deal of unnecessary trouble in carrying the anchors over the ice to the beach, with an idea of securing the ships to the shore at the breaking up of the ice in the spring; a precaution for which there was not the smallest occasion, and by which the cables suffered unnecessary exposure during the winter.

As soon as the ships were secured and housed over, my undivided attention was in the next place directed to the comfort of the officers and men, and to the preservation of that extraordinary degree of health which we had hitherto enjoyed in both ships. A few brief remarks on this subject by Mr. Edwards, (to whose skill and advice, as well as humane and unremitting attention to the few sick, on all occasions, I am much indebted,) I need make no apology for offering, in his own words:—"On our arrival in our winter quarters, after a season sufficiently harassing both to officers and men, it was pleasing to reflect on the excellent health they had experienced throughout. On our passage across the Atlantic, indeed, a few ephemeral complaints, arising from wet and cold, appeared among the men, but these were so slight as to be scarcely worthy of notice; and, since our arrival within the Polar circle, a period of between two and three months, not a single medical

case had been entered on the sick list. To this favourable account, one exception, however, must be made in the case of Lieutenant Liddon, who had suffered severely from an attack of rheumatism shortly after our leaving England, from which he had not yet recovered. With regard to accidents, we had been no less fortunate; a few injuries from frost, and one from a burn by gunpowder, which had not yet recovered, but which proved only of temporary inconvenience, constituting all the cases of this nature which had hitherto occurred. Not the slightest disposition to scurvy, the disease most to be apprehended under our present circumstances, had yet been evinced in either ship. In fact, the whole of the officers and men, with the few exceptions above mentioned, might be said to exhibit the finest aspect of health; and it was no less gratifying to observe, that their spirits were in perfect unison with their corporeal powers; so that it was impossible not to consider them as effective as at the commencement of the voyage. Under these co-existing circumstances, combined with the powerful preventives with which we were furnished, it was not unreasonable to indulge in a confident hope of finding ourselves at the beginning of the next season with our numbers undiminished, and our energies unimpaired." 1819. October.

In order to prolong this healthy state of the crews, and to promote the comfort of all, such arrangements were made for the warmth and dryness of the births and bed-places, as circumstances appeared to require; and in this respect some difficulties were to be overcome, which could not, perhaps, have been anticipated. Soon after our arrival in Winter Harbour, when the temperature of the atmosphere had fallen considerably below zero of Fahrenheit, we found that the steam from the coppers, as well as the breath and other vapour generated in the inhabited parts of the ship, began to condense into drops upon the beams and the sides, to such a degree as to keep them constantly wet. In order to remove this serious evil, it was necessary to adopt such means for producing a sufficient warmth, combined with due ventilation, as might carry off the vapour, and thus prevent its settling on any part of the ship. For this purpose a large stone oven, cased with cast iron, in which all our bread was baked during the winter was placed on the main-hatchway, and the stove-pipe led fore and aft on one side of the lower deck, the smoke being thus carried up the fore-hatchway. On the opposite side of the deck, an apparatus had been attached to the galley-range, for conveying a current of heated air between

1819. October. decks. This apparatus simply consisted of an iron box or air-vessel about fifteen inches square, through which passed three pipes, of two inches diameter, communicating from below with the external air, and uniting above in a metal box fixed to the side of the galley-range; to this box a copper stove pipe was attached, and conveyed to the middle part of the lower deck. When a fire was made under the air-vessel, the air became heated in its passage through the three pipes, from which it was conveyed through the stove-pipe to the men's births. While this apparatus was in good order, a moderate fire produced a current of air of the temperature of 87°, at the distance of seventeen feet from the fire-place; and, with a pipe of wood, or any other imperfect conductor of heat, which would not allow of its escaping by the way, it might undoubtedly be carried to a much greater distance. By these means we were enabled to get rid of the moisture about the births where the people messed; but when the weather became more severely cold, it still accumulated in the bed-places occasionally to a serious and very alarming degree. Among the means employed to prevent the injurious effects arising from this annoyance, one of the most efficacious perhaps was a screen made of fear-nought fixed to the beams round the galley, and dropping within eighteen inches of the deck, which served to intercept the steam from the coppers, and prevent it as before from curling along the beams, and condensing upon them into drops. This screen was especially useful at the time of drawing off the beer, which we had lately been in the habit of brewing from essence of malt and hops, and which continued to be served for several weeks as a substitute for part of the usual allowance of spirits. We found the steam arising from this process so annoying during the cold weather, that, valuable as the beer must be considered as an antiscorbutic beverage, it was deemed advisable to discontinue our brewery on that account. While on this subject, I may also add that, when the weather became severely cold, we could not get the beer to ferment, so as to make it palatable.

For the preservation of health, and as a necessary measure of economy, a few alterations were made in the quantity and quality of the provisions issued. I directed the allowance of bread to be permanently reduced to two-thirds, a precaution which, perhaps, it would have been as well to have adopted from the commencement of the voyage. A pound of Donkin's preserved meat, together with one pint of vegetable or concentrated soup per man, was substituted for one pound of salt beef weekly; a proportion of beer and wine was served in lieu of spirits; and a small quantity of sour

krout and pickles, with as much vinegar as could be used, was issued at regular intervals. The daily proportion of lime-juice and sugar was mixed together, and, with a proper quantity of water, was drank by each man in presence of an officer appointed to attend to this duty. This latter precaution may appear to have been unnecessary, to those who are not aware how much sailors resemble children in all those points in which their own health and comfort are concerned. Whenever any game was procured, it was directed to be invariably served in lieu of, and not in addition to, the established allowance of other meat, except in a few extraordinary cases, when such an indulgence was allowed; and in no one instance, either in quantity or quality, was the slightest preference given to the officers. 1819. October.

In the article of fuel, which is of such vital importance in so severe a climate, a system of the most rigid economy was adopted; such a quantity of coal only being expended as was barely sufficient for the preservation of health on board the ships. A search was made for turf or moss immediately after our arrival, and a small quantity of the latter was made use of as fuel; but, without a previous drying, which, from the advanced period of the season, we had no means of giving it, it was found to be too wet to produce any saving of coals. We also looked out most anxiously for a vein of coal on shore, but only a few lumps were picked up during our stay in Winter Harbour.

Great attention was paid to the clothing of the men, who were put into a certain number of divisions, according to the usual custom of the navy, each division being under the command of an officer, who was responsible for the personal cleanliness of the men intrusted to his charge, as well as for their keeping their clothes at all times mended and in good condition. The men were regularly mustered for inspection morning and evening, at which times I always visited every part of the between-decks, accompanied by Lieut. Beechey and Mr. Edwards; and one day in the week was appointed for the examination of the men's shins and gums by the medical gentlemen, in order that any slight appearance of the scurvy might at once be detected, and checked by timely and adequate means.

It was my intention to have caused the bedding of the ships' companies to be brought on deck, for the purpose of airing, at least once a week during the winter; but here, also, a difficulty occurred, which, without previous experience, could not perhaps have been easily anticipated. Whenever a

1819. October. blanket was brought on deck, and suffered to remain there for a short time, it of course acquired the temperature of the atmosphere. When this happened to be rather low, under zero of Fahrenheit for instance, the immediate consequence, on taking the blanket again into the inhabited parts of the ship was, that the vapour settled and condensed upon it, rendering it almost instantly so wet, as to be unfit to sleep on, and requiring, therefore, after all, that it should be dried by artificial heat before it could be returned into the bed-place. We were, therefore, under the necessity of hanging the bedding upon lines between decks, as the only mode of airing it; and what was likely to prove still more prejudicial, we were obliged to have recourse to the same unhealthy measure in drying the washed clothes.

Under circumstances of leisure and inactivity, such as we were now placed in, and with every prospect of its continuance for a very large portion of a year, I was desirous of finding some amusement for the men during this long and tedious interval. I proposed, therefore, to the officers to get up a Play occasionally on board the Hecla, as the readiest means of preserving among our crews that cheerfulness and good-humour which had hitherto subsisted. In this proposal I was readily seconded by the officers of both ships; and Lieutenant Beechey having been duly elected as stage-manager, our first performance was fixed for the 5th of November, to the great delight of the ship's companies. In these amusements I gladly undertook a part myself, considering that an example of cheerfulness, by giving a direct countenance to every thing that could contribute to it, was not the least essential part of my duty, under the peculiar circumstances in which we were placed.

In order still further to promote good-humour among ourselves, as well as to furnish amusing occupation, during the hours of constant darkness, we set on foot a weekly newspaper, which was to be called the *North Georgia Gazette and Winter Chronicle*, and of which Captain Sabine undertook to be the editor, under the promise that it was to be supported by original contributions from the officers of the two ships: and, though some objection may, perhaps, be raised against a paper of this kind being generally resorted to in ships of war, I was too well acquainted with the discretion, as well as the excellent dispositions of my officers, to apprehend any unpleasant consequences from a measure of this kind; instead of which I can safely say, that the weekly contributions had the happy effect of employing the leisure hours of those who

furnished them, and of diverting the mind from the gloomy prospect which would sometimes obtrude itself on the stoutest heart. 1819. October.

Immediately on our arrival in harbour, Captain Sabine had employed himself in selecting a place for the observatory, which was erected in a convenient spot, about seven hundred yards to the westward of the ships. It was also considered advisable immediately to set about building a house near the beach, for the reception of the clocks and instruments. For this purpose we made use of a quantity of fir-plank, which was intended for the construction of spare boats, and which was so cut as not to injure it for that purpose. The ground was so hard frozen that it required great labour to dig holes for the upright posts which formed the support of the sides. The walls of this house being double, with moss placed between the two, a high temperature could, even in the severest weather which we might be doomed to experience, be kept up in it without difficulty by a single stove.

Among the many fortunate circumstances which had attended us during this first season of our navigation, there was none more striking than the opportune time at which the ships were securely placed in harbour; for on the very night of our arrival, the 26th of September, the thermometer fell to $-1°$; and, on the following day, the sea was observed from the hills to be quite frozen over, as far as the eye could reach; nor was any open water seen after this period. During the first three weeks in October, however, we remarked that the young ice, near the mouth of the harbour, was occasionally squeezed up very much by the larger floes, so that the latter must still have had some space left, in which to acquire motion: but after that time the sea was entirely covered with one uniform surface of solid and motionless ice.

After our arrival in port, we saw several rein-deer, and a few coveys of grouse; but the country is so destitute of every thing like cover of any kind, that our sportsmen were not successful in their hunting excursions, and we procured only three rein-deer, previously to the migration of these and the other animals from the island, which took place before the close of the month of October, leaving only the wolves and foxes to bear us company during the winter. The full-grown deer, which we killed in the autumn, gave us from one hundred and twenty to one hundred and seventy pounds of meat each, and a fawn weighed eighty-four pounds.

On the 1st of October, Captain Sabine's servant having been at some distance from the ships, to examine a fox-trap, was pursued by a large white

1819. October. Mon. 5. bear, which followed his footsteps the whole way to the ships, where he was wounded by several balls, but made his escape after all. This bear, which was the only one we saw during our stay in Winter Harbour, was observed to be more purely white than any we had before seen, the colour of these animals being generally that of a dirtyish yellow, when contrasted with the whiteness of the ice and snow.

On the night of the 4th, we had a strong gale from the southward, which gave us a satisfactory proof of the security of the harbour we had chosen; for the main ice was found in the morning to have pressed in very forcibly upon that which was newly formed near the entrance, while within the two points of the harbour, it remained perfectly solid and undisturbed. Some deer being seen near the ships on the 10th, a party was despatched after them, some of whom having wounded a stag, and being led on by the ardour of pursuit, forgot my order that every person should be on-board before sun-set, and did not return till late, after we had suffered much apprehension on their account. I, therefore, directed that the expense of all rockets and other signals made in such cases, should, in future, be charged against the wages of the offending party. John Pearson, a marine belonging to the Griper, who was the last that returned on board, had his hands severely frost-bitten, having imprudently gone away without mittens, and with a musket in his hand. A party of our people most providentially found him, although the night was very dark, just as he had fallen down a steep bank of snow, and was beginning to feel that degree of torpor and drowsiness which, if indulged, inevitably proves fatal. When he was brought on board, his fingers were quite stiff, and bent into the shape of that part of the musket which he had been carrying: and the frost had so far destroyed the animation in his fingers on one hand, that it was necessary to amputate three of them a short time after, notwithstanding all the care and attention paid to him by the medical gentlemen. The effect which exposure to severe frost has, in benumbing the mental as well as the corporeal faculties, was very striking in this man; as well as in two of the young gentlemen who returned after dark, and of whom we were anxious to make inquiries respecting Pearson. When I sent for them into my cabin, they looked wild, spoke thick and indistinctly, and it was impossible to draw from them a rational answer to any of our questions. After being on board for a short time, the mental faculties appeared gradually to return with the returning circulation, and it was not till then that a looker-on could easily persuade himself that

they had not been drinking too freely. To those who have been much accustomed to cold countries this will be no new remark; but I cannot help thinking (and it is with this view that I speak of it) that many a man may have been punished for intoxication, who was only suffering from the benumbing effects of frost; for I have more than once seen our people in a state so exactly resembling that of the most stupid intoxication, that I should certainly have charged them with that offence, had I not been quite sure that no possible means were afforded them on Melville Island, to procure any thing stronger than snow-water. In order to guard in some measure against the danger of persons losing their way, which was more and more to be apprehended as the days became shorter, and the ground more covered with snow, which gives such a dreary sameness to the country, we erected on all the hills within two or three miles of the harbour, finger-posts pointing towards the ships. 1819. October.

I have before remarked that all the water which we made use of while within the polar circle, was procured from snow, either naturally or artificially dissolved. Soon after the ships were laid up for the winter, it was necessary to have recourse entirely to the latter process, which added materially to the expenditure of fuel during the winter months. The snow for this purpose was dug out of the drifts, which had formed upon the ice round the ships, and dissolved in the coppers. We found it necessary always to strain the water thus procured, on account of the sand which the heavy snow-drifts brought from the island, after which it was quite pure and wholesome.

On the evening of the 13th, the Aurora Borealis was seen very faintly, consisting of a stationary white light in the south-west quarter, and near the horizon. Wed. 13.

On the 15th, we saw the last covey of ptarmigan which were met with this season. On the same day our people fell in with a herd of fifteen deer to the southward; they were all lying down at first, except one large one, probably a stag, which afterwards seemed to guard the rest in their flight, going frequently round them, and sometimes striking them with his horns to make them go on, which otherwise they did not seem much inclined to do. Frid. 15.

On the 16th, it blew a strong gale from the northward, accompanied by such a constant snow-drift, that although the weather was quite clear overhead, the boat-house, at the distance of three or four hundred yards, could scarcely be seen from the ships. On such occasions, no person was permitted on any account to leave the ships. Indeed, when this snow-drift Sat. 16.

1819. October. occurred, as it frequently did during the winter, with a hard gale, and the thermometer very low, I believe that no human being could have remained alive after an hour's exposure to it. In order, therefore, to secure a communication between the ships, a distance not exceeding half a cable's length, as well as from the ships to the house on shore, a line was kept extended, as a guide from one to the other. About the middle of October the snow began to fall in smaller flakes than during the summer; and soon after this, whenever it fell, it consisted entirely of very minute *spiculæ*, assuming various forms of crystallization. The meridian altitude of the sun was observed this day by an artificial horizon, which I notice from the circumstance of its being the last time we had an opportunity of observing it for about four months.

17 & 18. On the 17th and 18th, our hunting parties reported that the deer were more numerous than they had been before, which made us conclude, that they were assembling their forces for an immediate departure over the ice to the continent of America, as we only saw one or two on the island after this time. They had been met with, since taking up our quarters, in herds of from eight to twenty, and from forty to fifty were seen in the course of one day. A thermometer placed in the sun at noon, on the 18th, rose only

Tues. 19. to − 9°, the temperature in the shade being − 16°.

It had for some time past been a matter of serious consideration with me, whether it would be necessary to cut the ice round the ships, which had by this time become so firmly attached to the bends, that they were completely imbedded in it. There happened to be only two or three persons in the expedition, who had ever been frozen up during a whole winter in any of the cold countries, and I consulted these as to the expediency of doing so. This precaution, it would seem, is considered to be necessary, from the possibility of a ship being hung by the ice attached to her bends, and thus prevented from rising and falling with the tide; in consequence of which, a plank might easily be torn out near the water-line, by the weight of the ship hanging entirely on that particular part. I was relieved from any apprehension on this score, however, by knowing how small the rise and fall of the tides were in this place; and also by having observed that a spring-tide caused the whole mass of ice in the harbour to detach itself from the beach, along the whole line of which it split, and was lifted; so that both ships and ice arose and fell in a body with the tide. The only question, therefore, that remained, was, whether the lateral expansion

of the ice might not create such a pressure upon the water-line of the ships as to do them some damage. This apprehension was rather increased by Lieutenant Liddon's having reported to me, that his officers had, a night or two before, heard a loud crack about the Griper's bends, which gave them the idea of something straining or giving way. This noise, however, which occurred very frequently afterwards, as the cold became more intense, proved to be nothing more than that which is not unusually heard in houses in cold countries, being occasioned by the freezing and expansion of the juices contained in wood not thoroughly seasoned. To put the matter out of all doubt, however, I deemed it prudent to order the ice to be cut round both ships, an operation which occupied the two crews almost the whole of two days, the ice being now twenty-three inches in thickness; and I determined to continue this operation daily, as long as the weather would permit. 1819. October.

The 20th of October was one of the finest days which, as experience has since taught us, ever occur in this climate, the weather being clear, with little or no wind; and, though the thermometer remained steadily between −15° and −16° during the day, it was rather pleasant to our feelings than otherwise. Our sportsmen were out from both ships the whole day, and returned, for the first time, without having seen any living animal, though they had walked over a very considerable extent of ground; so that the hope we had indulged of obtaining, occasionally, a fresh meal, was now nearly at an end for the rest of the winter. It was observed from the hills, that the ice in the offing had been thrown into higher hummocks than before; and in the morning we saw a number of little vertical streams of vapour rising from the sea, near the mouth of the harbour, which was probably that phenomenon vulgarly called the "barber," in North America, and which is occasioned, I believe, by the vapour arising from the water being condensed into a visible form by the coldness of the atmosphere. It is probable, therefore, from the two circumstances now mentioned, that a motion had taken place among the floes in the offing, producing first the pressure by which the hummocks were thrown up, and then a partial separation, leaving for a time a small space of unfrozen surface. Wed. 20.

Between six and eight P.M., we observed the Aurora Borealis, forming a broad arch of irregular white light, extending from N.N.W. to S.S.E., the centre of the arch being 10° to the eastward of the zenith. It was most bright near the southern horizon; and frequent, but not vivid, coruscations

1819. October. were seen shooting from its upper side, towards the zenith. The magnetic needle was not sensibly affected by this phenomenon.

Thur. 21. Between two and three P.M. on the 21st, the weather being still remarkably clear and fine, and the sun near the horizon, a parhelion strongly prismatic was seen on each side of it, at the distance of 23°, resembling the legs of a rainbow resting upon the land.

Tues. 26. On the 26th, the sun afforded us sufficient light for writing and reading in my cabin, the stern-windows exactly facing the south, from half-past nine till half-past two; for the rest of the four-and-twenty hours we lived, of course, by candle-light. Nothing could exceed the beauty of the sky to the south-east and south-west at sun-rise and sun-set about this period: near the horizon there was generally a rich bluish purple, and a bright arch of deep red above, the one mingling imperceptibly with the other. The weather about this time was remarkably mild, the mercury in the thermometer having stood at or above zero for more than forty-eight hours. By a register of the temperature of the atmosphere, which was kept by Captain Sabine at the observatory, it was found that the thermometer, invariably, stood at least from 2° to 5°, and even on one or two occasions as much as 7° higher on the outside of the ships, than it did on shore, owing probably to a warm atmosphere, created round the former by the constant fires kept up on board.

Frid. 29. On the 29th the weather was calm and clear, and we remarked, for the first time, that the smoke from the funnels scarcely rose at all, but skimmed nearly horizontally along the housing, the thermometer having got down to −24°*, and the mercury in the barometer standing at 29.70 inches. It now became rather a painful experiment to touch any metallic substance in the open air with the naked hand; the feeling produced by it exactly resembling that occasioned by the opposite extreme of intense heat, and taking off the skin from the part affected. We found it necessary, therefore, to use great caution in handling our sextants and other instruments, particularly the eye-pieces of the telescopes, which, if suffered to touch the face, occasioned an intense burning pain; but this was easily remedied by covering them over with soft leather. Another effect, with regard to the use of instruments, began to appear about this time. Whenever any instrument, which had been some time

* By a Meteorological Journal in my possession, kept at York Fort, Hudson's Bay, in the year 1795, it appears that this phenomenon did not occur till the thermometer indicated a temperature of abo ut 36°. The height of the barometer is not mentioned.

exposed to the atmosphere, so as to be cooled down to the same temperature, was suddenly brought below into the cabins, the vapour was instantly condensed all around it, so as to give the instrument the appearance of smoking, and the glasses were covered almost instantaneously with a thin coating of ice, the removal of which required great caution to prevent the risk of injuring them until it had gradually thawed, as they acquired the temperature of the cabin. When a candle was placed in a certain direction from the instrument, with respect to the observer, a number of very minute *spiculæ* of snow were also seen sparkling around the instrument, at the distance of two or three inches from it, occasioned, as we supposed, by the cold atmosphere produced by the low temperature of the instrument almost instantaneously congealing into that form the vapour which floated in its immediate neighbourhood. 1819. October.

The month of November commenced with mild weather, which continued for the first ten days. It is generally supposed, by those who have not experienced the effects produced upon the feelings by the various alterations in the temperature of the atmosphere, when the thermometer is low, that a change of 10° or 15° makes no sensible difference in the sensation of cold; but this is by no means the case, for it was a remark continually made among us, that our bodies appeared to adapt themselves so readily to the climate, that the scale of our feelings, if I may so express it, was soon reduced to a lower standard than ordinary; so that, after living for some days in a temperature of −15° or −20°, it felt quite mild and comfortable when the thermometer rose to zero, and *vice versâ*. Novemb.

The 4th of November being the last day that the sun would, independently of the effects of refraction, be seen above our horizon till the eighth of February, an interval of ninety-six days, it was a matter of considerable regret to us that the weather about this time was not sufficiently clear to allow us to see and make observations on the disappearance of that luminary, in order that something might be attempted towards determining the amount of the atmospherical refraction at a low temperature. But though we were not permitted to take a last farewell, for at least three months, of that cheering orb, "of this great world, both eye and soul," we nevertheless felt that this day constituted an important and memorable epoch in our voyage. We had, some time before, set about the preparations for our winter's amusements; and the theatre being ready, we opened on the 5th of November, with the representation of *Miss in her Teens*, which afforded to the men such a fund of amusement as fully to justify the expectations we had formed of the utility of Thurs. 4. Frid. 5.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, at Sea, during the Month of *October*, 1819.

Day	Temperature of Air in shade.			Temperature of Sea Water at the surface.	Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.		
	°	°	°	°	inches.	inches.	inches.		
1	+ 9	+ 6	+ 6.83	29.12	29.89	29.82	29.860	N.N.W. to S.	Light airs and fine.
2	17.5	9.5	12.83	28.87	29.76	29.73	29.740	S.S.E.	Light breezes and fine.
3	10	6	8.75	29.12	29.77	29.68	29.760	S.W.	Light breezes with small snow.
4	16	5	9.83	28.62	29.59	29.17	29.390	S. Westerly	Fresh breezes and hazy with snow.
5	13	— 7	3.00	28.00	29.71	29.10	29.440	N.W.bN.	Strong breezes and cloudy.
6	8	— 8	— 1.80	28.00	29.81	29.50	29.730	Westerly.	Strong breezes and hazy with snow.
7	15	0	+ 6.10	28.00	29.26	29.20	29.225	S.W.	Strong breezes and hazy.
8	1	— 8.5	+ 3.75	28.40	30.00	29.46	29.805	N.N.W.	Fresh breezes and cloudy.
9	0	— 5	— 1.83	28.00	30.00	29.93	29.952	West	Moderate and cloudy.
10	5	— 3	+ 1.83	28.00	29.83	29.68	29.752	S.S.W.	Moderate and fine.
11	10	+ 2	+ 4.54	28.00	29.69	29.60	29.630	West.	Moderate and hazy.
12	+ 7	— 8	— 4.17	28.00	29.63	29.44	29.535	N.N.W.	Fresh breezes and fine.
13	+16	+ 3	+ 7.60	28.00	29.57	29.43	29.490	Half E.S.E. Half West.	Fresh breezes and hazy.
14	+ 5	— 6	— 2.50	28.00	30.00	29.44	29.710	W.N.W.	Moderate and cloudy.
15	+ 13	0	+ 6.17	28.00	29.62	29.30	29.425	Half East. Half North.	Strong breezes and cloudy, with snow.
16	— 1	—12.5	— 5.20	27.50	29.91	29.49	29.742	N.b.W.	Fresh breezes and hazy.
17	—10.5	—16	— 12.88	28.00	30.20	29.93	30.095	North	Moderate and fine clear weather.
18	— 2	—14	— 6.08	28.00	30.22	30.18	30.190	N.N.W.	Light breezes and fine.
19	— 7	—14	— 11.25	27.62	30.20	29.98	30.120	West	Moderate and cloudy.
20	—13.5	—17.5	— 15.12	27.62	30.00	29.93	29.955	N.N.W.	Light breezes and fine.
21	— 7	—14	— 10.58	28.00	30.21	30.00	30.100	Ditto.	Ditto ditto.
22	— 3	—14	— 9.92	28.00	30.32	30.27	30.300	North	Light breezes and cloudy.
23	+ 6	— 9	+ 0.12	28.00	30.13	30.03	30.070	North	Fresh breezes and hazy, with drift snow.
24	+ 1	— 6	— 2.83	28.25	30.06	30.01	30.045	North	Fresh breezes and hazy.
25	+ 5	+ 2	+ 3.71	28.00	30.16	30.05	30.112	N.bW.	Moderate and cloudy.
26	+	— 8	— 1.08	28.40	30.11	30.06	30.090	Ditto	Light breezes and cloudy.
27	— 4	—15	— 10.25	28.12	30.02	29.87	29.955	North	Light breezes and fine clear weather.
28	—17	—23	— 19.75	28.00	29.79	29.72	29.771	N.N.W.	Moderate and fine.
29	—20	—28	— 24.25	28.00	29.73	29.69	29.710	N.bW.	Light breezes and fine.
30	—25	—27.5	— 26.15	28.00	29.73	29.70	29.717	Ditto.	Ditto ditto.
31	— 4	—28	— 12.17	28.00	29.91	29.70	29.847	N.N.W.	Light airs and cloudy.
	+17.5	—28	— 3.46	28.114	30.32	29.10	29.81		

theatrical entertainments under our present circumstances, and to determine me to follow them up at stated periods. I found indeed, that even the occupation of fitting up the theatre, and taking it to pieces again, which employed a number of the men for a day or two before and after each performance, was a matter of no little importance, when the immediate duties of the ship appeared by no means sufficient for that purpose; for I dreaded the want of employment as one of the worst evils that was likely to befal us. 1819. Novemb.

On the 6th we tried the temperature of the sea at the bottom, the depth being five fathoms, and found it to be 30°, whilst that of the surface was 28°, and of the air −16°. On the 9th, the temperature of the bottom was as high as 31°, the surface being still at 28°. The specific gravity of the surface water was 1.0264, at the temperature of 52°, and that of the water brought from the bottom 1.0265, at 50°. On the same evening, the weather being fine and clear, the Aurora Borealis was seen for nearly two hours, forming a long, low, irregular arch of light, extending from north to south in the western quarter of the heavens, its altitude in the centre being 3° or 4°. The electrometer-chain was hoisted up to the mast-head, and its lower end brought down to the ice, so as to keep it perfectly clear of all the masts and rigging, which method was used throughout the winter; but no sensible effect was produced on the gold-leaf. It was tried a second time, after the sky became full of white fleecy clouds, but with as little success. Sat. 6. Tues. 9.

On the forenoon of the 11th, the thermometer having again fallen to $-26\frac{1}{2}°$, the smoke, as it escaped from the funnels, scarcely rose at all above the housing. Mr. Ross, having gone to the mast-head at noon, reported that he saw the sun. There was no time for measuring the altitude, but Lieutenant Beechey, who went up to observe it, considered that about twenty-four minutes of its disk appeared above the horizon, according to which the amount of refraction would appear to be 2° 09′ 05″. The temperature of the atmosphere at this time was −27°, and the mercury in the barometer stood at 30.07 inches. The thermometer having fallen to −31° on the following day, we expected to have seen the sun again, and looked out from the mast-head for that purpose, but it did not re-appear. At six P.M. the Aurora Borealis was seen in a broken irregular arch, about 6° high in the centre, extending from N.W. b. N. to S. b. W., from whence a few coruscations were now and then faintly emitted towards the zenith. From eight P.M. till midnight on the 13th, it was again seen in a similar manner from S.W. to S.E., the brightest part being in the centre, or due south. On the 15th, Lieutenant Beechey informed me that Thur. 11. Frid. 12. Sat. 13.

1819. Novemb. he had seen, in the N.N.W. and S.E. quarters, some light transparent clouds, from which columns of light were thrown upwards, resembling the Aurora Borealis; those to the S.E., being opposed to a very light sky, had a light-brown
Tues. 16. appearance. This phenomenon was again observed on the 16th, consisting of a bright stationary light from S.S.W. to S. b. E., and reaching from the horizon to the height of about 6° above it.

About the time of the sun's leaving us, the wolves began to approach the ships more boldly, howling most piteously on the beach near us, sometimes for hours together, and, on one or two occasions, coming alongside the ships, when every thing was quiet at night; but we seldom saw more than one or two together, and, therefore, could form no idea of their number. These animals were always very shy of coming near our people, and, though evidently suffering much from hunger, never attempted to attack any of them. The white foxes used also to visit the ships at night, and one of these (*Canis Lagopus*) was caught in a trap, set under the Griper's bows. The uneasiness displayed by this beautiful little animal during the time of his confinement, whenever he heard the howling of a wolf near the ships, impressed us with an opinion, that the latter is in the habit of hunting the fox as his prey.

Wed. 17. The rapidity with which the ice formed round the ships had now become so great, as to employ our people for several hours each day in cutting it; and for the last three days our utmost labour, during the time of twilight, could scarcely keep it clear. As it was evident, therefore, that, as the frost increased, we could not possibly effect this, and as the men almost always got their feet wet in sawing the ice, from which the most injurious effects upon their health were likely to result, I gave orders to leave off cutting it any more during the severity of the winter. The average formation of ice round the ships, during the time we continued to remove it, was usually from three to five inches in twenty-four hours; and once it froze eight inches in twenty-six hours, the mean temperature of the atmosphere being −12°. At noon to-day we saw, for the first time at this hour, a star of the first magnitude (*Capella*), and at half an hour past noon, those of the second magnitude in Ursa Major were visible; which circumstance will, perhaps, give the best idea of the weakness of the sun's light at this period. At three P.M. a remarkable variety of the Aurora Borealis was seen by several of the officers. Having about this time been confined for a few days to my cabin by indisposition, I am indebted to Lieutenant Beechey for the following description of it:—"Clouds of a light-brown colour were seen, diverging from a point near the horizon bearing

S.W. b. S., and shooting pencils of rays upwards at an angle of about 45° with the horizon. These rays, however, were not stationary as to their position, but were occasionally extended and contracted. From behind these, as it appeared to us, flashes of white light were repeatedly seen, which sometimes streamed across to the opposite horizon, some passing through the zenith, others at a considerable distance on each side of it. This phenomenon continued to display itself brilliantly for half an hour, and then became gradually fainter till it disappeared, about four o'clock. The sun, at the time of the first appearance of this meteor, was on nearly the same bearing, and about 5° below the horizon." 1819. Novemb.

The temperature of the atmosphere having, about this time, become considerably lower than before, the cracking of the timbers was very frequent and loud for a time; but generally ceased altogether in an hour or two after this fall had taken place in the thermometer, and did not occur again at the same temperature during the winter. The wind blowing fresh from the northward, with a heavy snow-drift, made the ship very cold below; so that the breath and other vapour accumulated during the night in the bed-places and upon the beams, and then immediately froze; hence it often occupied all hands for two or three hours during the day to scrape the ice away, in order to prevent the bedding from becoming wet by the increase of temperature occasioned by the fires. It was therefore found necessary to keep some of the fires in between decks at night, when the thermometer was below −15° or −20° in the open air, especially when the wind was high. To assist in keeping the lower decks warm, as well as to retard, in some slight degree, the formation of ice immediately in contact with the ships' bends, we banked the snow up against their sides, as high as the main-chains; and canvass screens were nailed round all the hatchways on the lower deck. Thur. 18.

The stars of the second magnitude in Ursa Major were just perceptible to the naked eye a little after noon this day, and the Aurora Borealis appeared faintly in the south-west at night. About this time our medical gentlemen began to remark the extreme difficulty with which sores of every kind healed; a circumstance that rendered it the more necessary to be cautious in exposing the men to frost-bites, lest the long inactivity and want of exercise during the cure of sores in other respects trifling, should produce serious effects upon the general health of the patients.

From midnight on the 20th, till two o'clock on the following morning, the thermometer rose from −46° to −40½°, and at half-past three a gale came Sun. 21.

1819. Novemb. on from the northward, which continued to blow, and the thermometer gradually to rise, till the latter had reached −21° at midnight. This was one of a great many instances which occurred during the winter, of an increase of wind, from whatever quarter, being accompanied by a simultaneous rise in the thermometer. The gale continued strong for the greater part of the two following days, with a tremendous snow-drift, which kept us all on board till the afternoon of the 23d. In the mean time another play had been prepared, and our second performance, to which the crews had been anxiously looking forward, took place on the evening of the 24th.

The temperature of the ship's holds, at this time, was generally from 27° to 34°, the aftermost being always the warmest, and a considerable quantity of the beer was found frozen in the casks. The thermometer seldom
Sun. 26 rose higher than 40° on the lower deck, throughout the day. On the 26th in the morning, some vivid coruscations of the Aurora Borealis were observed from S. to N.W., commencing at 4° or 5° of altitude, and streaming towards the zenith.

Early in the afternoon of the 20th, Captain Sabine observed a small meteor fall to the ground in the W. by N., not apparently more than a mile distant. It fell slowly, with a faint white light, which increased considerably as it approached the earth. When first seen, its height was about 8° or 10°, and the descent appeared perpendicular, or nearly so. The atmosphere at this time was remarkably clear. Soon after the moon rose this afternoon, it was curiously deformed by refraction, the lower edges of its disk appearing indented with deep notches, and at other times seeming to be cut off square at the bottom. A single ray, or rather a column of light, of the same diameter as the moon, was also observed to descend from it to the top of the hill,
29 & 30. like a pillar supporting it. On this and the two following nights, we were occupied from five to seven hours in taking lunar distances in the open air, the thermometer being from −34° to −36°. This we did without any material inconvenience, as long as the weather continued calm or nearly so; but with a moderate breeze it soon became too painful to handle the screws of the sextant. The difficulty of making observations in this climate is not, however, confined to the sensation of cold produced by handling the instruments, or by standing still for several hours together at so low a temperature; but it is also necessary to hold the breath very carefully during the time of making the observation; for if the least vapour be suffered to touch the instrument, it is immediately converted into a coat of ice, which dims

the glasses, and renders the instrument unserviceable till the ice has been thawed, and the instrument thoroughly cleaned. Our sextants were somewhat injured, in the cold weather, by the cracking of the silver on the horizon and index glasses, arising as we supposed, from the unequal contraction of the two substances. The mercury of the artificial horizons froze into a solid mass as we were observing the moon's altitude in it, although the thermometer on shore indicated only − 36°. This was probably owing to the mercury having become adulterated by admixture with the lead of the troughs, which disposed it to congeal at a higher temperature than the freezing point of pure mercury. 1819. Novemb.

At half-past six P.M., on the 1st of December, part of a circular halo, whose radius was 22° 52′, was observed round the moon, which was near the full. Part of a well-defined horizontal circle of white light, passing through the moon, extended also for several degrees on each side of her, and in the points where this circle intersected the halo, were two prismatic spots of light, or paraselenæ. In that part of the halo which was immediately over the moon, was another spot much brighter; and opposite to it, in the lower part of the circle, another similar but much more faint. About the same time, on the following evening, two concentric circles were observed round the moon, the radius of the smaller being 38°, and of the larger 46°. Upon the inner circle were four paraselenæ, strongly prismatic, situated with respect to the moon as on the preceding day; and there was also a faint horizontal circle of white light, passing through the moon as before. The weather was fine in both these instances, but there was still a sort of haziness in the atmosphere which prevented the heavenly bodies being very distinctly seen. Decemb. Wed. 1. Thur. 2.

On the 10th, at two P.M., Captain Sabine observed a small meteor fall in the direction of N.N.W. from the ships, similar in character and appearance to that seen on the 28th of November, except that the light was not so vivid, and it was extinguished, instead of burning more fiercely, before it reached the earth. About this time we were a good deal annoyed for some days together by the thermometer continuing higher than usual, the wind being from the E.S.E., which caused a considerable degree of dampness between decks, in consequence of the ice thawing in every crevice where it could not readily be removed in any other way. This annoyance could only be got rid of by constant wiping, and by increasing the fires for the time: but, when the thermometer fell to 15° or 20° below zero, it again became solid, and ceased to be an inconvenience. Frid. 10.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA during the Month of *November*, 1819.

Day	Temperature of Air in shade.			Temperature of Sea Water at the Surface.	Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.		Maximum.	Minimum.	Mean.		
	°	°	°	° +	inches.	inches.	inches.		
1	+2	−3	− 1.00	28	29.89	29.81	29.870	North / N.N.W.	Light breezes and hazy. / Moderate and hazy.
2	+5	0	+ 3.25	29.5	29.90	29.81	29.865	N.N.W.	Light breezes and hazy.
3	+6	0	+ 3.92		30.02	29.93	29.975	N.b.W.	Ditto ditto.
4	+6	+	+ 5.50		30.17	30.07	30.120	N.E. round by West to S.S.E.	Ditto ditto.
5	+6	−7	− 0.67	29	30.30	30.21	30.272	North	Ditto. Ditto
6	−8	−18	−14.08	28	30.32	30.27	30.298	North	Moderate and fine.
7	−6.5	−16	−11.12	30	30.08	30.00	30.030	North	Moderate and hazy.
8	−5	−13	−10.04		29.93	29.93	29.930	North	Moderate and fine.
9	−11	−15	−12.75	28.5	29.98	29.87	29.920	N.b.W.	Strong breezes and hazy, with drift snow.
10	−6.6	−15	− 9.67	30	30.07	30.00	30.047	N.b.W.	Moderate and hazy, with snow.
11	−13	−26.5	−18.62		30.07	30.025	30.039	N.N.W.	Moderate breezes and fine.
12	−24	−32	−28.58		30.13	30.025	30.074	North	Light breezes and fine clear weather.
13	−24	−34	−28.50	29.5	29.95	29.86	29.920	N.W.	Moderate and hazy.
14	−25	−32	−26.08	29.5	29.81	29.79	29.802	S.S.E.	Light breezes and hazy.
15	−21	−40	−30.88	30	29.95	29.73	29.790	Calm / West	Fine weather. / Moderate and fine clear weather.
16	−36	−42	−39.79		30.20	30.04	30.142	S.W.	Light breezes and fine.
17	−30	−40	−35.63		30.21	30.09	30.158	North	Ditto. Ditto.
18	−34	−37	−36.00		30.07	29.97	30.054	N.N.W.	Fresh breezes and clear, with drift snow.
19	−38	−47	−42.92		30.20	30.12	30.165	North round by West to S.W.	Light airs and fine—calm at times.
20	−40	−47	−43.71		30.14	29.96	30.057	Half N.N.W. Half North	Light breezes and fine.
21	−20	−40.5	−27.79		29.81	29.72	29.765	North	Fresh breezes and hazy, with drift snow.
22	−21	−25	−23.00		29.72	29.72	29.720	North	Strong gales and squally, with considerable drift
23			−25		30.20	29.92	30.060	North	Ditto. Ditto
24			−15		30.11	29.83	29.982	North	Fresh breezes and fine, with drift snow.
25	−5	−18	−11.75		29.81	29.73	29.770	N.b.W.	Moderate breezes and hazy, with light snow.
26	−20	−28	−24.79		29.70	29.67	29.690	N.N.W.	Light breezes and fine.
27	−13	−28.5	−18.38		29.67	29.63	29.650	West	Ditto Ditto.
28	−24.5	−32	−28.29		29.80	29.68	29.750	North	Light breezes and fine.
29	−31	−32.5	−31.92		29.75	29.72	29.740	North / Calm	Light variable airs and calms.
30	−32	−34	−33.58		29.73	29.66	29.695	N.N.W.	Light airs and fine clear weather.
	+ 6	−47	−20.60		30.32	29.63	29.945		

On the 14th of December, the day was beautifully serene and clear, and there was more redness in the southern sky about noon, than there had been for many days before; the tints, indeed, might almost be called prismatic. At six P.M., the Aurora Borealis was seen forming two concentric arches, passing from the western horizon on each side of the zenith to within 20° of the opposite horizon, resting on a dark cloud about seven degrees high, from behind which the light appeared to issue, and partially streaming from the cloud to the zenith. No effect was produced by it on the electrometer or the magnetic needle. The appearance I have just described of the light seeming to issue from behind an obscure cloud, is a very common one; it is not always, however, easy to tell whether any cloud really exists, or whether the appearance is a deception arising from the vivid light of the Aurora being contrasted with the darker colour of the sky near it. 1819. Decemb. Tues. 14.

On the 17th, in the morning, this phenomenon was again observed, being a stationary faint light from S.W. to W.S.W. The breeze freshened up strong from the eastward, and the thermometer gradually rose, as usual, till at four P.M. it had reached zero, being the first time that it had stood so high since the 5th of November. The water in the Hecla's pump-well had, by this time, become completely frozen, so that it was no longer possible to work the pumps. In what manner the pumps could be kept free under such circumstances, if it were found necessary, I do not know, as there would have been a risk of damaging the lower part of them, in detaching the ice from it to make the experiment. The Hecla, however, was so tight as not to require it; as a proof of which it need only be mentioned, that the same twenty inches of ice which was formed about this period, remained without any addition for more than six months, during which time she was never once pumped out; and the only inconvenience that resulted from this, was the accumulation of a small quantity of ice among the coals in the lower part of the fore and main holds. Frid. 17.

About this part of the winter, we began to experience a more serious inconvenience from the bursting of the lemon-juice bottles by frost, the whole contents being frequently frozen into a solid mass, except a small portion of highly-concentrated acid in the centre, which, in most instances, was found to have leaked out, so that when the ice was thawed, it was little better than water. This evil increased to a very alarming degree in the course of the winter: some cases being opened in which more than two-thirds of the lemon-juice was thus destroyed, and the remainder rendered nearly inefficient. It

1819. Decemb. was at first supposed that this accident might have been prevented by not quite filling the bottles, but it was afterwards found, that the corks flying out did not save them from breaking. We observed that the greatest damage was done in those cases which were stowed nearest to the ship's side, and we, therefore, removed all the rest amidships, a precaution which, had it been sooner known and adopted, would probably have prevented, at least, a part of the mischief. The vinegar, also, became frozen in the casks in the same manner, and lost a great deal of its acidity when thawed. This circumstance conferred an additional value on a few gallons of very highly concentrated vinegar, which had been sent out on trial, upon this and the preceding voyage, and which, when mixed with six or seven times its own quantity of water, was sufficiently acid for every purpose. This vinegar, when exposed to the temperature of 25° below zero, congealed only into a consistence like that of the thickest honey, but was never sufficiently hard to break any vessel which contained it. There can be no doubt, therefore, that on this account as well as to save stowage, this kind of vinegar should exclusively be used in these regions; and, for similar reasons, of still greater importance, the lemon-juice should be concentrated.

Sun. 19. On the 19th, the weather being fine and clear, the Aurora Borealis appeared frequently at different times of the day, generally from the south to the W.N.W. quarters, and not very vivid. From eight P.M. till midnight, however, it became more brilliant, and broke out in every part of the heavens, being generally most bright from S.S.W. to S.W., where it had the appearance of emerging from behind a dark cloud about five degrees above the horizon. We could not, however, help feeling some disappointment in not having yet witnessed this beautiful phenomenon in any degree of perfection, which could be compared to that which occurs at Shetland, or in the Atlantic,

Mon. 20. about the same latitude as these islands. On the morning of the 20th, the Aurora Borealis again made its appearance in the N.W., which was more to the northward than usual; it here resembled two small bright clouds, the one nearly touching the other, and being about seven degrees above the horizon. These remained quite stationary for half an hour, and then broke up into streams shooting rapidly towards the zenith.

Wed. 22. We had now reached the shortest day, and such was the occupation which we had hitherto contrived to find during the first half of our long and gloomy winter, that the quickness with which it had come upon us was a subject of general remark. So far, indeed, were we from wanting that occupation

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

Drawn & Engraved by W. Westall A.R.A. from a Sketch made on the Spot by Lieut.t Beechey

H.M. Ships Hecla & Griper in Winter Harbour.

Published by John Murray London March 6.th 1821

ASIATIC SOCIETY MU

ASIATIC SOCIETY MUMBAI

of which I had been apprehensive, especially among the men, that it accidentally came to my knowledge about this period, that they complained of not having time to mend their clothes. This complaint I was as glad to hear, as desirous to rectify; and I therefore ordered that, in future, one afternoon in each week should be set aside for that particular purpose. 1819. Decemb.

The circumstances of our situation being such as have never before occurred to the crews of any of His Majesty's ships, it may not, perhaps, be considered wholly uninteresting, to know in what manner our time was thus so fully occupied throughout the long and severe winter, which it was our lot to experience, and particularly during a three months' interval of nearly total darkness.

The officers and quarter-masters were divided into four watches, which were regularly kept, as at sea, while the remainder of the ship's company were allowed to enjoy their night's rest undisturbed. The hands were turned up at a quarter before six, and both decks were well rubbed with stones and warm sand before eight o'clock, at which time, as usual at sea, both officers and men went to breakfast. Three-quarters of an hour being allowed after breakfast for the men to prepare themselves for muster, we then beat to divisions punctually at a quarter-past nine, when every person on board attended on the quarter-deck, and a strict inspection of the men took place, as to their personal cleanliness, and the good condition, as well as sufficient warmth, of their clothing. The reports of the officers having been made to me, the people were then allowed to walk about, or, more usually, to run round the upper deck, while I went down to examine the state of that below, accompanied, as I before mentioned, by Lieutenant Beechey and Mr. Edwards. The state of this deck may be said, indeed, to have constituted the chief source of our anxiety, and to have occupied by far the greatest share of our attention at this period. Whenever any dampness appeared, or, what more frequently happened, any accumulation of ice had taken place during the preceding night, the necessary means were immediately adopted for removing it; in the former case usually by rubbing the wood with cloths, and then directing the warm air-pipe towards the place; and in the latter, by scraping off the ice, so as to prevent its wetting the deck by any accidental increase of temperature. In this respect the bed-places were particularly troublesome; the inner partition, or that next the ship's side, being almost invariably covered with more or less dampness or ice, according to the temperature of the deck during the preceding night. This inconvenience might

1819. Decemb. to a great degree have been avoided, by a sufficient quantity of fuel to keep up two good fires on the lower deck, throughout the twenty-four hours; but our stock of coals would by no means permit this, bearing in mind the possibility of our spending a second winter within the Arctic circle; and this comfort could only, therefore, be allowed on a few occasions, during the most severe part of the winter.

In the course of my examination of the lower deck, I had always an opportunity of seeing those few men who were on the sick list, and of receiving from Mr. Edwards a report of their respective cases; as also of consulting that gentleman as to the means of improving the warmth, ventilation, and general comfort of the inhabited parts of the ship. Having performed this duty, we returned to the upper deck, where I personally inspected the men; after which they were sent out to walk on shore when the weather would permit, till noon, when they returned on board to their dinner. When the day was too inclement for them to take this exercise, they were ordered to run round and round the deck, keeping step to a tune on the organ, or, not unfrequently, to a song of their own singing. Among the men were a few who did not at first quite like this systematic mode of taking exercise: but when they found that no plea, except that of illness, was admitted as an excuse, they not only willingly and cheerfully complied, but made it the occasion of much humour and frolic among themselves.

The officers, who dined at two o'clock, were also in the habit of occupying one or two hours in the middle of the day in rambling on shore, even in our darkest period, except when a fresh wind and a heavy snow-drift confined them within the housing of the ships. It may be well imagined that at this period, there was but little to be met with in our walks on shore, which could either amuse or interest us. The necessity of not exceeding the limited distance of one or two miles, lest a snow-drift, which often rises very suddenly, should prevent our return, added considerably to the dull and tedious monotony which, day after day, presented itself. To the southward was the sea, covered with one unbroken surface of ice, uniform in its dazzling whiteness, except that, in some parts, a few hummocks were seen thrown up somewhat above the general level. Nor did the land offer much greater variety, being almost entirely covered with snow, except here and there a brown patch of bare ground in some exposed situations, where the wind had not allowed the snow to remain. When viewed from the summit of the neighbouring hills, on one of those calm and clear days, which not

unfrequently occurred during the winter, the scene was such as to induce contemplations, which had, perhaps, more of melancholy than of any other feeling. Not an object was to be seen on which the eye could long rest with pleasure, unless when directed to the spot where the ships lay, and where our little colony was planted. The smoke which there issued from the several fires, affording a certain indication of the presence of man, gave a partial cheerfulness to this part of the prospect, and the sound of voices which, during the cold weather, could be heard at a much greater distance than usual, served now and then to break the silence which reigned around us, a silence far different from that peaceable composure which characterizes the landscape of a cultivated country; it was the death-like stillness of the most dreary desolation, and the total absence of animated existence. Such, indeed, was the want of objects to afford relief to the eye or amusement to the mind, that a stone of more than usual size appearing above the snow, in the direction in which we were going, immediately became a mark, on which our eyes were unconsciously fixed, and towards which we mechanically advanced. 1819. December.

Dreary as such a scene must necessarily be, it could not, however, be said to be wholly wanting in interest, especially when associated in the mind with the peculiarity of our situation, the object which had brought us hither, and the hopes which the least sanguine among us sometimes entertained, of spending a part of our next winter in the more genial climate of the South-Sea Islands. Perhaps, too, though none of us then ventured to confess it, our thoughts would sometimes involuntarily wander homewards, and institute a comparison between the rugged face of nature in this desolate region, and the livelier aspect of the happy land which we had left behind us.

We had frequent occasion, in our walks on shore, to remark the deception which takes place in estimating the distance and magnitude of objects, when viewed over an unvaried surface of snow. It was not uncommon for us to direct our steps towards what we took to be a large mass of stone, at the distance of half a mile from us, but which we were able to take up in our hands after one minute's walk. This was more particularly the case, when ascending the brow of a hill, nor did we find that the deception became less, on account of the frequency with which we experienced its effects.

In the afternoon, the men were usually occupied in drawing and knotting yarns, and in making points and gaskets; a never-failing resource, where mere occupation is required, and which it was necessary to perform entirely

1819. Decemb. on the lower deck, the yarns becoming so hard and brittle, when exposed on deck to the temperature of the atmosphere, as to be too stiff for working, and very easily broken. I may in this place remark, that our lower rigging became extremely slack during the severity of the winter, and gradually tightened again as the spring returned: effects the very reverse of those which we had anticipated, and which I can only account for by the extreme dryness of the atmosphere in the middle of winter, and the subsequent increase of moisture.

At half-past five in the evening, the decks were cleared up, and at six we again beat to divisions, when the same examination of the men and of their births and bed-places took place as in the morning; the people then went to their supper, and the officers to tea. After this time the men were permitted to amuse themselves as they pleased, and games of various kinds, as well as dancing and singing occasionally, went on upon the lower deck till nine o'clock, when they went to bed, and their lights were extinguished. In order to guard against accidents by fire, where so many fires and lights were necessarily in use, the quarter-masters visited the lower deck every half hour during the night, and made their report to the officers of the watches that all was, in this respect, safe below; and to secure a ready supply of water in case of fire, a hole was cut twice a day in the ice, close alongside each ship. It is scarcely necessary to add, that the evening occupations of the officers were of a more rational kind than those which engaged the attention of the men. Of these, reading and writing were the principal employments, to which were occasionally added a game at chess, or a tune on the flute or violin, till half-past ten, about which time we all retired to rest.

Such were the employments which usually occupied us for six days in the week, with such exceptions only as circumstances at the time suggested. On Sundays, divine service was invariably performed, and a sermon read on board both ships; the prayer appointed to be daily used at sea being altered, so as to adapt it to the service in which we were engaged, the success which had hitherto attended our efforts, and the peculiar circumstances under which we were at present placed. The attention paid by the men to the observance of their religious duties, was such as to reflect upon them the highest credit, and tended in no small degree to the preservation of that regularity and good conduct, for which, with very few exceptions they were invariably distinguished.

A monument was erected on this hill & a cylinder deposited

N.E. Hill
Height above the level of the sea 244 feet

Survey of WINTER HARBOUR MELVILLE ISLAND June 1820

The land gradually rises from Reef Point to the N.E. Hill

Ravine

¼ ½ ¾ 1
Scale of one Mile

Observatory
Lat. 74. 47. 10 N.
Lon. 110. 48. 15 W.
Dip. 88. 43. 0 N.
Var. 127. 47. 50 E.

Ravine

Reef Point

Shoal Bay

Leading mark from Hecla & Griper Bay into Winter Harbour
The large stone open to the S.E. of Hummocks at the end of the Reef

A remarkable mass of Sand stone, resembling the roof of a house on which the Ships names were engraved.

Ravine

Represents hummocks of Ice aground in shoal water

Tides

Mean time of High Water on full & change days in Winter Harbour 1.29

	May	June	July
Maximum of their height	4 . 02	3 . 7	3 . 9
Minimum	0 . 10	1 . 4	1 . 5
Mean	2 . 6½	2 . 7	2 . 8¼

The Soundings are marked at ½ tide those within the dotted line are in feet

ASIATIC SOCIETY MUMBAI

Published by John Murray Albemarle Street London March 1821.

J. Walker Sculp.

ASIATIC SOCIETY MUMBAI

Our theatrical entertainments took place regularly once a fortnight, and continued to prove a source of infinite amusement to the men. Our stock of plays was so scanty, consisting only of one or two volumes, which happened accidentally to be on board, that it was with difficulty we could find the means of varying the performances sufficiently; our authors, therefore, set to work, and produced, as a Christmas piece, a musical entertainment, expressly adapted to our audience, and having such a reference to the service on which we were engaged, and the success we had so far experienced, as at once to afford a high degree of present recreation, and to stimulate, if possible, the sanguine hopes which were entertained by all on board, of the complete accomplishment of our enterprise. We were at one time apprehensive, that the severity of the weather would have prevented the continuance of this amusement, but the perseverance of the officers overcame every difficulty; and, perhaps for the first time since theatrical entertainments were invented, more than one or two plays were performed, on board the Hecla, with the thermometer below zero on the stage. 1819. Decemb.

The *North Georgia Gazette*, which I have already mentioned, was a source of great amusement, not only to the contributors, but to those who, from diffidence of their own talents, or other reasons, could not be prevailed on to add their mite to the little stock of literary composition, which was weekly demanded; for those who declined to write were not unwilling to read, and more ready to criticise than those who wielded the pen; but it was that good-humoured sort of criticism that could not give offence. The subjects handled in this paper were, of course, various, but generally applicable to our own situation. Of its merits or defects it will not be necessary for me to say any thing here, as I find that the officers, who were chiefly concerned in carrying it on, have agreed to print it for the entertainment of their friends; the publisher being at liberty, after supplying each with a certain number of copies, to dispose of the rest.

The return of each successive day had been always very decidedly marked by a considerable twilight for some time about noon, that on the shortest day being sufficient to enable us to walk out very comfortably for nearly two hours*. There was usually, in clear weather, a beautiful arch of bright

* It will, perhaps, give the best idea of the power of the sun's light afforded us on this day, to state, that we could at noon read, with tolerable ease, the same sized type, as that in which this note is printed; but this could only be done by turning the book directly towards the south.

1819. Decemb. red light, overspreading the southern horizon for an hour or two before and after noon, the light increasing, of course, in strength, as the sun approached the meridian. Short as the day now was, if indeed any part of the twenty-four hours could properly be called by that name, the reflection of light from the snow, aided occasionally by a bright moon, was at all times sufficient to prevent our experiencing, even under the most unfavourable circumstances, any thing like the gloomy night which occurs in more temperate climates. Especial care was taken, during the time the sun was below the horizon, to preserve the strictest regularity in the time of our meals, and in the various occupations which engaged our attention during the day; and this, together with the gradual and imperceptible manner in which the days had shortened, prevented this kind of life, so novel to us in reality, from appearing very inconvenient, or indeed like any thing out of the common way. It must be confessed, however, that we were not sorry to have arrived, without any serious suffering, at the shortest day; and we watched, with no ordinary degree of pleasure, the slow approach of the returning sun.

We had generally found the ice to crack near the shore, as I have already had occasion to observe, about the second day after the new and full moon, in consequence of the highest tides taking place at that time; but this was not the case in the present lunation; the separation of the ice from the beach not having taken place till the 22d, or five days and eight hours after the time of the new moon. This retardation of the tides may, perhaps, have arisen from the circumstance of the moon and sun having both had their greatest south declination about the usual time of the highest spring-tide. It may possibly have been affected also by fresh gales from the eastward, which blew on the 17th and 18th.

Sat. 25. On Christmas-day the weather was raw and cold, with a considerable snow-drift, though the wind was only moderate from the N.W.; but the snow which falls during the severe winter of this climate is composed of spiculæ so extremely minute, that it requires very little wind to raise and carry it along. To mark the day in the best manner which circumstances would permit, divine service was performed on board the ships; and I directed a small increase in the men's usual proportion of fresh meat as a Christmas-dinner, as well as an additional allowance of grog, to drink the health of their friends in England. The officers also met at a social and friendly dinner, and the day passed with much of the same kind of festivity by which it is usually distinguished at home; and, to the credit of the men be it spoken,

without any of that disorder by which it is too often observed by seamen. A piece of English roast-beef, which formed part of the officers' dinner, had been on board since the preceding May, and preserved without salt during that period, merely by the antiseptic properties of a cold atmosphere. 1819. Decemb.

Between eight and nine A.M. on the 26th, the wind freshened up very suddenly to a strong breeze from the northward and westward, and during that hour the thermometer rose from −20° to −6°. In the afternoon the wind became moderate and variable in its direction, and the thermometer had again fallen to −17° at midnight, and continued to fall very gradually for the four following days, till on the 30th it had reached −43°, being the lowest temperature we had yet experienced. During the whole of that interval the weather was nearly calm, and very fine and clear, and at half past seven A.M. on the 30th, the mercury in the barometer stood at 30.755 inches, being the highest we had yet seen it during the voyage. The colours of the southern sky near the horizon were observed to be remarkably prismatic at noon on that day.

A great many frost-bites occurred about this time, principally in the men's feet, even when they had been walking quickly on shore for exercise. On examining their boots, Mr. Edwards remarked, that the stiffness of the thick leather, of which they were made, was such as to cramp the feet, and prevent the circulation from going on freely, and that this alone was sufficient to account for their feet having been frost-bitten. Being very desirous of avoiding these accidents, which from the increased sluggishness with which the sores healed, were more and more likely to affect the general health of the patients by long confinement, I directed a pair of canvass boots, lined with blanketing, or some other woollen stuff, to be made for each man, using raw hide as soles; this completely answered the desired purpose, as scarcely any frost-bites in the feet afterwards occurred, except under circumstances of very severe exposure. Thur. 30.

On the 31st of December, another striking instance occurred of the simultaneous rise in the wind and the thermometer. At two A.M. the latter stood at −28°, but the wind freshening up to a strong breeze from the northward and eastward, and afterwards from the S.S.E. in the course of the day, the thermometer gradually rose at the same time, and stood at +5° at midnight; thus closing the year with milder weather than we had enjoyed for the eight preceding weeks. Frid. 31.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *December*, 1819.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	−25	−34	−30.29	29.60	29.57	29.582	Round the compass.	Light airs and fine.
2	28	36	32.96	29.60	29.52	29.570	Half N.N.W. / Half S.b.E.	Ditto ditto.
3	9	22	16.04	29.46	29.40	29.430	S.b.E.	Fresh breezes and hazy.
4	26	34	31.71	29.42	29.36	29.395	W.N.W.	Moderate and hazy.
5	27	35	31.25	29.46	29.36	29.397	N.b.W.	Moderate and fine.
6	23	34	27.00	29.51	29.45	29.470	West.	Light airs and fine.
7	19	26	22.29	29.67	29.53	29.592	S.E.	Light airs and hazy.
8	15	22	19.67	29.80	29.67	29.738	E.S.E.	Moderate and clear.
9	17	21	18.83	29.89	29.83	29.867	E.b.S.	Fresh breezes and hazy.
10	18	21	19.38	29.90	29.89	29.893	East.	Fresh breezes and clear.
11	4	20	11.21	29.80	29.65	29.715	E.b.S.	Fresh breezes and hazy.
12	9	20	14.42	29.74	29.67	29.700	North	Fresh breezes and clear.
13	7	14	10.96	29.92	29.79	29.865	N.W.b.N.	Light breezes and hazy.
14	7	10	8.29	30.40	30.04	30.230	A.M., N.W.b.W. / P.M., S.W.	Ditto ditto.
15	7	16	11.63	30.39	30.23	30.350	East.	Moderate and hazy.
16	8	18	13.50	30.31	30.13	30.240	E.S.E.	Moderate and fine clear weather.
17	0	9	4.37	30.00	29.85	29.905	East.	Strong breezes and cloudy, with drift.
18	3	11	5.00	29.90	29.84	29.886	East.	Ditto ditto.
19	9	24	17.46	29.95	29.94	29.945	N.N.W.	Moderate and fine.
20	19	25	22.83	29.96	29.93	29.940	N.b.W.	Fresh breezes and cloudy.
21	19	25	23.50	30.11	30.00	30.071	North	Ditto with drift.
22	27	35	31.00	30.06	30.05	30.052	N.N.W.	Light breezes and fine.
23	30	37	33.83	30.10	30.03	30.060	N.W.	Ditto ditto
24	24	34	31.17	30.01	29.71	29.842	Half N.W. / Half N.N.W.	Moderate and fine.
25	23.5	30	26.04	29.69	29.59	29.648	N.W.	Ditto ditto.
26	5	34	16.21	29.35	29.10	29.226	N.W.	Fresh breezes and hazy with drift.
27	17	32	24.58	29.94	29.47	29.710	W.N.W.	Moderate and fine.
28	34	39	36.75	30.33	30.01	30.162	South.	Light breezes and fine.
29	34	40	37.38	30.71	30.40	30.562	South.	Ditto ditto.
30	30	43	38.96	30.75	30.62	30.688	North	Ditto ditto.
31	+ 6	28	7.17	30.39	29.80	30.092	A.M., N.N.E. / P.M., East.	Strong breezes and hazy with drift snow.
	+ 6	−43	−21.79	30.75	29.10	29.865		

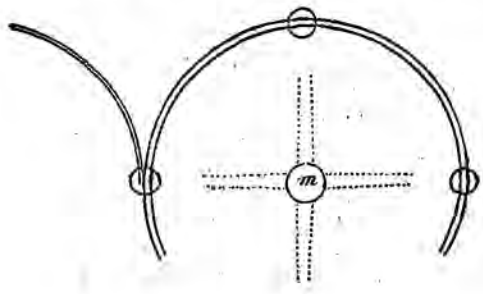
CHAPTER VI.

FIRST APPEARANCE OF SCURVY—THE AURORA BOREALIS AND OTHER METEOROLOGICAL PHENOMENA—VISITS OF THE WOLVES—RE-APPEARANCE OF THE SUN—EXTREME LOW TEMPERATURE—DESTRUCTION OF THE HOUSE ON SHORE BY FIRE—SEVERE FROST-BITES OCCASIONED BY THIS ACCIDENT.

THE mild weather with which the new year commenced was not of long duration; for, as the wind gradually moderated, the thermometer slowly fell once more to the average temperature of the atmosphere at this season. The quantity of snow which had fallen at this time was so small, that its general depth on shore did not exceed one or two inches, except where it had drifted into the ravines and hollows. At ten A.M., on the 1st, a halo, whose radius was 22° 30′, with three paraselenæ, which were very luminous, but not tinged with the prismatic colours, was seen about the moon, similar to that described on the 1st of December; and on the following day the same phenomenon occurred, with the addition of a vertical stripe of white light proceeding from the upper and lower limbs of the moon, and forming, with a part of the horizontal circle seen before, the appearance of a cross, as shewn in the accompanying diagram. There was also at times an arc of another

1820. January. Sat. 1.

Sun. 2.



1820. January. circle touching the halo, which sometimes reached almost to the zenith, and changed the intensity of its light very frequently, not unlike the Aurora Borealis.

I received this morning the first unpleasant report of the scurvy having made its appearance among us: Mr. Scallon, the gunner of the Hecla, had for some days past been complaining of pains in his legs, which Mr. Edwards at first took to be rheumatic, but which together with the appearance of his gums, now left no doubt of the symptoms being scorbutic. It is so uncommon a thing for this disease to make its first appearance among the officers, that Mr. Edwards was naturally curious to inquire into the cause of it; and at length discovered that Mr. Scallon's bedding was in so damp a state, in consequence of the deposit of moisture in his bed-place, which I have before mentioned, as to leave no doubt that to this circumstance, as the immediate exciting cause, his illness might justly be attributed. The difficulty of preventing this deposit of moisture, and the consequent accumulation of ice, was much greater in the officers' bed-places than in those of the men, in consequence of the former being necessarily placed in close contact with the ships' sides, and forming an immediate communication, as it were, with the external atmosphere; whereas in the latter, there was a vacant interval of eighteen inches in width interposed between them. To prevent, as much as possible, therefore, the injurious effects of this evil upon the health of the officers, I appointed certain days for the airing of their bedding by the fires, as well as for that of the ships' companies. Every attention was paid to Mr. Scallon's case by the medical gentlemen, and all our anti-scorbutics were put in requisition for his recovery; these consisted principally of preserved vegetable soups, lemon-juice, and sugar, pickles, preserved currants and gooseberries, and spruce-beer. I began also about this time to raise a small quantity of mustard and cress in my cabin, in small shallow boxes filled with mould, and placed along the stove-pipe; by these means, even in the severity of the winter, we could generally ensure a crop at the end of the sixth or seventh day after sowing the seed, which, by keeping several boxes at work, would give to two or three scorbutic patients nearly an ounce of salad each daily, even though the necessary economy in our coals did not allow of the fire being kept in at night. Had this been allowable, and a proper apparatus at hand for the purpose, there is no doubt that it might have been raised much more rapidly: and those who are aware how perfect a specific a very small quantity of *fresh* vegetable sub-

stance is for the scurvy, will, perhaps, agree with me in thinking that such an apparatus would form a very valuable appendage to be applied occasionally to the cabin-stove. The mustard and cress thus raised were necessarily colourless, from the privation of light, but, as far as we could judge, they possessed the same pungent aromatic taste as if grown under ordinary circumstances. So effectual were these remedies in Mr. Scallon's case, that, on the ninth evening from the attack, he was able to walk about on the lower deck for some time, and he assured me that he could then "run a race." 1820. January.

On the morning of the 4th, a cross appeared about the moon, consisting of vertical and horizontal rays of white light, similar to those described on the 2d, but unaccompanied by any halo. The thermometer was at −44° in the early part of the day; but the wind freshening to a strong breeze from the northward, the temperature of the atmosphere was considerably raised, as usual, the thermometer having got up to −36° at ten P.M. The temperature of the holds in the fore-part of the ship was now generally as low as 22°, that of the Hecla's lower-deck being seldom above 40°, except during the ships' companies' meals.

The 7th of January was one of the most severe days to the feelings which we experienced during the winter, the wind being strong from the northward with a heavy drift, and the thermometer continuing from −38° to −40°. It is impossible to conceive any thing more inclement than such a day, when we could with difficulty pass and repass between the two ships, and were glad to keep every person closely confined on board. Frid. 7.

At half-past five P.M., on the 8th, the Aurora Borealis was seen forming a broken and irregular arch of white light, 10° or 12° high in the centre, extending from N.b.W., round by W. to S.S.E. with occasional coruscations proceeding from it towards the zenith. It continued thus for an hour, and re-appeared from eight o'clock till midnight in a similar manner, making, however, but a poor display of this beautiful phenomenon. Neither the magnetic needle, nor the gold-leaf of the electrometer, were, in either instance, in the slightest degree affected by it. Sat. 8.

At eight A.M. on the 11th, faint coruscations of the Aurora Borealis were observed to dart with inconceivable rapidity across the heavens from W.N.W. to E.S.E., from horizon to horizon, and passing about 25° to the south of the zenith. At noon to-day, the temperature of the atmosphere had got down to 49° below zero, being the greatest degree of cold which we had yet Tues. 11.

1820. January. experienced; but the weather being quite calm, we walked on shore for an hour without inconvenience, the sensation of cold depending much more on the degree of wind at the time, than on the absolute temperature of the atmosphere, as indicated by the thermometer. In several of the accounts given of those countries in which an intense degree of natural cold is experienced, some effects are attributed to it which certainly did not come under our observation in the course of this winter. The first of these is the dreadful sensation said to be produced on the lungs, causing them to feel as if torn asunder, when the air is inhaled at a very low temperature. No such sensation was ever experienced by us, though in going from the cabins into the open air, and *vice versâ*, we were constantly in the habit for some months of undergoing a change of from 80° to 100°, and, in several instances, 120° of temperature in less than one minute; and what is still more extraordinary, not a single inflammatory complaint, beyond a slight cold which was cured by common care in a day or two, occurred during this particular period. The second is, the vapour with which the air of an inhabited room is charged, condensing into a shower of snow, immediately on the opening of a door or window, communicating with the external atmosphere. This goes much beyond any thing that we had an opportunity of observing. What happened with us was simply this; on the opening of the doors at the top and bottom of our hatchway ladders, the vapour was immediately condensed by the sudden admission of the cold air, into a visible form, exactly resembling a very thick smoke, which settled on all the pannels of the doors and bulk-heads, and immediately froze, by which means the latter were covered with a thick coating of ice which it was necessary frequently to scrape off; but we never, to my knowledge, witnessed the conversion of the vapour into snow, during its fall.

Sat. 15. On the evening of the 15th, the atmosphere being clear and serene, we were gratified by a sight of the only very brilliant and diversified display of Aurora Borealis, which occurred during the whole winter; I believe it to be almost impossible for words to give an idea of the beauty and variety which this magnificent phenomenon displayed; I am at least certain, that no description of mine can convey an adequate conception of it, and I therefore gladly avail myself of the following account, by Captain Sabine, which was furnished by my request at the time for insertion in my Journal.

"Mr. Edwards, from whom we first heard that the Aurora was visible,

described it as forming a complete arch, having its legs nearly north and south of each other, and passing a little to the eastward of the zenith. When I went upon the ice, the arch had broken up; towards the southern horizon was the ordinary Aurora, such as we had lately seen on clear nights, being a pale light, apparently issuing from behind an obscure cloud, at from six to twelve degrees of altitude, extending more or less towards the east or west on different nights, and at different times of the same night, having no determined centre or point of bisection, the greater part, and even at times the whole of the luminous appearance being sometimes to the east, and sometimes to the west of south, but rarely seen in the northern horizon, or beyond the east and west points of the heavens. This corresponds with the Aurora most commonly noticed in Britain, except that it is there as peculiar to the northern as here to the southern horizon, occasionally shooting upwards in rays and gleams of light. It was not distinguished by any unusual brilliancy or extent on this occasion, the splendid part of the phenomenon being detached and apparently quite distinct. 1820. January.

"The luminous arch had broken into irregular masses, streaming with much rapidity in different directions, varying continually in shape and intensity, and extending themselves from north, by the east, to south. If the surface of the heavens be supposed to be divided by a plane passing through the meridian, the Aurora was confined, during the time I saw it, to the eastern side of the plane, and was usually most vivid and in larger masses in the E.S.E. than elsewhere. Mr. Parry and I noticed to each other, that where the Aurora was very brilliant, the stars seen through it were somewhat dimmed, though this remark is contrary to former experience.

"The distribution of light has been described as irregular and in constant change; the various masses, however, seemed to have a tendency to arrange themselves into two arches, one passing near the zenith, and a second about midway between the zenith and horizon, both having generally a north and south direction, but curving towards each other, so that their legs produced would complete an ellipse; these arches were as quickly dispersed as formed. At one time a part of the arch near the zenith was bent into convolutions, resembling those of a snake in motion, and undulating rapidly; an appearance which we had not before observed. The end towards the north was also bent like a shepherd's crook, which is not uncommon. It is difficult to compare the light produced by an Aurora with that of the moon, because the shadows are rendered faint and indistinct by reason of the general

1820. January. diffusion of the Aurora; but I should think the effect of the one now described, scarcely equal to that of the moon when a week old. The usual pale light of the Aurora strongly resembles that produced by the combustion of phosphorus; a very slight tinge of red was noticed on this occasion, when the Aurora was most vivid, but no other colours were visible. Soon after we returned on board, the splendid part wholly disappeared, leaving only the ordinary light near the horizon; in other respects, the night remained unchanged, but on the following day it blew a fresh gale. from the north and N.N.W." This Aurora had the appearance of being very near us, and we listened attentively for the sound which is said sometimes to accompany brilliant displays of this phenomenon, but neither on this nor on any other oc-

Sun. 16. casion, could any be distinguished. On the following day, the Aurora was repeatedly seen for an hour or two together, assuming the shape of a long low arch, from 3° to 12° high in the centre, extending from south to N.W.

About this time it had been remarked, that a white setter dog belonging to Mr. Beverly had left the Griper for several nights past at the same time, and had regularly returned after some hours' absence. As the daylight increased, we had frequent opportunities of seeing him in company with a she-wolf, with whom he kept up an almost daily intercourse for several weeks, till at length he returned no more to the ships; having either lost his way by rambling to too great a distance, or what is more likely, perhaps, been destroyed by the male wolves. Some time after, a large dog of mine, which was also getting into the habit of occasionally remaining absent for some time, returned on board a good deal lacerated and covered with blood, having, no doubt, maintained a severe encounter with a male wolf, whom we traced to a considerable distance by the tracks on the snow. An old dog, of the Newfoundland breed, that we had on board the Hecla, was also in the habit of remaining out with the wolves for a day or two together; and we frequently watched them keeping company on the most friendly terms.

Tues. 25. A wolf, which crossed the harbour close to the ships on the 25th, was observed to be almost entirely white, his body long and extremely lean, standing higher on his legs than any of the Esquimaux dogs, but otherwise much resembling them; his tail was long and bushy, and always hanging between his legs, and he kept his head very low in running. It is extraordinary that we could never succeed in killing or catching one of these animals, though we were, for months, almost constantly endeavouring to do so.

As the time was now near at hand when the sun was to re-appear above our horizon, we began this day to look out for it from the mast-head, in order that some observations might be made, as to the amount of the atmospherical refraction, which might render it visible to us sooner than under ordinary circumstances. For this purpose, and at the same time to avoid the frost-bites which might have occurred from keeping any individual at the mast-head for too long a space, every man in the ship was sent up in succession, so as to occupy the time for ten minutes before and after noon; and this practice was continued till the sun appeared above the horizon from the deck, which it did not do till nine days after the commencement of it. 1820. January.

The loss of lemon-juice, of which I have before had occasion to speak, in consequence of the breaking of the bottles by frost, continued still to take place to so great a degree, that it now became absolutely necessary to adopt some measures for providing against similar contingencies in future, and to preserve the remainder; I, therefore, consulted Mr. Edwards as to the propriety of reducing the daily allowance of that essential article to three-quarters of the usual proportion, being three-quarters of an ounce per man: this, he was of opinion, under all circumstances, it was expedient to do, in order to ensure a supply in those cases of a scorbutic nature which might hereafter occur; and this reduction was accordingly ordered in both ships.

At half-past ten P.M., a complete halo of pale light was observed round the moon, its radius being 22°.40, and a similar phenomenon occurred on the following night, about the same time. These phenomena almost always began to make their appearance about the time of full moon. Wed. 26.

The weather was remarkably clear and fine on the 28th, and the sky beautifully red to the southward; but we looked for the sun from the mast-head without success. Captain Sabine remarked at noon, that none of the fixed stars, even of the first magnitude, could be seen by the naked eye; Mars, however, was plainly visible, by which some judgment may be formed of the power of the sun's light at this period. Towards the end of January we began to open some of our ports, in order to admit sufficient light for the carpenters and armourers to work by, and these were employed in repairing the main-top-sail-yard, that we might at least make some shew of commencing our re-equipment for sea.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *January*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	−2	−28	−18.33	29.93	29.72	29.812	S.S.E.	Strong breezes and clear weather.
2	−19	−29	−24.58	29.71	29.63	29.673	E.S.E.	Moderate and hazy weather.
3	−29	−42	−34.62	30.00	29.73	29.870	West to S.S.W.	Light variable airs.
4	−34	−44	−40.17	30.24	30.03	30.132	N.b.W.	Fresh breezes and fine clear weather.
5	−26	−35	−32.00	30.23	30.20	30.207	N.N.W.	Moderate and fine.
6	−22	−33	−28.58	30.16	30.09	30.119	N.N.W.	Light breezes and hazy, to fresh breezes and fine.
7	−32	−10	−37.67	30.10	30.03	30.068	N.N.W.	Fresh breezes and fine weather.
8	−33	−38	−35.83	30.14	29.87	30.025	N.N.W.	Ditto. with drift snow.
9	−33	−35	−34.42	30.31	30.10	30.220	W.N.W. to S.E.	Light airs and fine clear weather.
10	−32	−43	−36.17	30.35	30.34	30.345	S.E.	Ditto ditto.
11	−43	−46	−44.42	30.33	30.25	30.287	A.M., Calm. P.M., N.N.W.	Fine weather. P.M. Light airs and fine.
12	−42	−47	−44.71	30.24	30.10	30.168	N.N.W.	Light airs to strong breezes—fine weather.
13	−40.5	−47	−45.29	30.31	30.26	30.288	W.N.W.	Light breezes and fine.
14	−32	−40	−35.08	30.20	30.18	30.193	N.b.W.	Strong breezes :—much drift.
15	−34	−39	−35.73	30.51	30.20	30.335	East.	Light breezes and fine.
16	−34	−39	−37.08	30.77	30.63	30.701	N.N.E.	Ditto ditto.
17	−16	−34	−24.50	30.59	30.29	30.438	North.	Strong gales and hazy—heavy drift.
18	− 5	−15	−10.25	30.25	30.15	30.202	North.	A.M., Strong gales with heavy drift. P.M., More moderate.
19	− 8	−28	−17.56	30.25	30.19	30.223	South to N.W.	Light variable airs and hazy weather.
20	−16	−31	−24.46	30.13	30.10	30.117	East.	Light breezes and fine.
21	−16	−23	−19.00	30.09	30.01	30.068	North.	A.M. Ditto ditto. P.M. Fresh breezes with heavy drift.
22	−22	−29	−26.00	30.15	30.06	30.107	N.b.W.	Strong breezes with much drift.
23	−18	−26	−22.50	30.11	30.06	30.093	N.N.W.	Light breezes to strong breezes with heavy drift.
24	−20	−28	−24.83	29.87	29.59	29.695	N.N.W.	Fresh gales and squally.
25	−23	−30	−26.42	29.69	29.66	29.677	North.	Moderate and fine.
26	−26	−36	−31.17	29.75	29.67	29.701	North.	Fresh breezes to light breezes.
27	−32	−36	−33.96	29.90	29.75	29.827	North.	Ditto ditto.
28	−35	−39	−37.23	30.14	29.94	30.056	N.b.W.	Light to strong breezes—clear weather.
29	−19	−33	−26.12	30.11	29.94	30.041	North.	Moderate and fine weather.
30	−19	−20	−19.58	29.93	29.90	29.907	North to W.N.W.	Light breezes and hazy.
31	−23	−28	−24.54	29.85	29.83	29.840	W.N.W. to East.	Light airs and hazy.
	—	−47	−30.99	30.77	29.59	30.078		

On the 1st and 2d of February the weather was rather hazy, so that the sun could not have been seen had it been above the horizon, but the 3d was a beautifully clear and calm day. At eight A.M., a cross, consisting of the usual vertical and horizontal rays, was seen about the moon. At twenty minutes before apparent noon, the sun was seen from the Hecla's main-top, at the height of fifty-one feet above the sea, being the first time that this luminary had been visible to us since the 11th of November, a period of eighty-four days, being twelve days less than the time of its remaining actually beneath the horizon, independently of the effects of atmospherical refraction. On ascending the main-top, I found the sun to be plainly visible over the land to the south; but at noon there was a dusky sort of cloud hanging about the horizon, which prevented our seeing any thing like a defined limb, so as to measure or estimate its altitude correctly. The sun appeared, however, to be about half its diameter above the land, and the top of the land was 4′ 30″ above the horizon of the sea, by which the whole amount of refraction would appear to have been 1° 24′ 04″; in which there is nothing very extraordinary in this latitude and low temperature; that of the atmosphere at this time was −38°, and the mercury in the barometer stood at 29.96 inches, the smoke from the fires on board rising quite perpendicularly, which was not usually the case under similar circumstances. A vertical column of pale red light extended from the upper part of the sun's disc to about 3° of altitude; its intensity was observed to be constantly varying, being at times very bright, at others, scarcely perceptible. In these changes, which were exceedingly rapid, it was not unlike the Aurora Borealis, the light always appearing to shoot upwards, as is most usual in that phenomenon. The breadth of this column, which was visible for about three-quarters of an hour before and after noon, was equal to that of the sun's diameter, and it was much the brightest next the sun. A similar column of light had also been observed by Captain Sabine, at ten A.M., immediately over the spot where the sun was.

1820. Febr. Thurs. 3.

On several occasions, in the course of the winter, there was an appearance in the southern horizon very much resembling land at a great distance. This appearance was to-day unusually well defined, and seemed to terminate in a very abrupt and decided manner, on a S. b. E. bearing from Winter Harbour.

At six P.M. the Aurora Borealis appeared very faintly in a horizontal line

1820. Febr. of white light, extending from S. to S.S.W., and about 5° above the horizon. From nine to eleven, it was again seen quite stationary, and very faint, from S.S.W. to W.N.W., at three or four degrees of altitude.

Captain Sabine had, for some time past, kept one of the needles used for determining the intensity of the magnetic force, suspended by a silk thread in the observatory, for the purpose of remarking more satisfactorily than it could be done on board the ships, whether any effect was produced upon it by the Aurora Borealis. It might be supposed that, in these regions, where the directive power of the needle had almost entirely ceased, it would be more easily disturbed by any adventitious cause, than in those parts of the globe where the directive energy was greater; but we never could perceive the slightest derangement to be produced in it by the Aurora.

Frid. 4. On the 4th we had another sight of the sun, which was so distorted by refraction, that nothing like a circular disk could at any time be distinguished. At noon a thermometer, plunged into a bank of snow to the depth of two feet, indicated the temperature of − 12°, that of the atmosphere being − 38°. The temperature of the sea-water was 29° in the fire-hole alongside the Hecla, and that of her holds varied from 25° to 22°, the aftermost being progressively the warmest. There was to-day an unusual kind of mist in the lower part of the atmosphere, which was at times so thick, that the ships could scarcely be seen at the distance of two miles. It was a matter of frequent remark with us, that, even on the clearest winter days of this climate, there was usually a considerable deposit of very light snow, which was scarcely perceptible, except when interposed between the eye and any dark object, or by the quantity of it which settled on any instrument left to stand in the open air: nor do I think that the heavenly bodies were ever so clearly visible as they are on a winter's night in England.

Mon. 7. At noon on the 7th, we had the first clear view of the sun which we had yet enjoyed since its re-appearance above our horizon, and an indistinct parhelion, or mock sun, slightly prismatic, was seen on the eastern side of it, at the distance of 22°.

There was now sufficient day-light, from eight o'clock till four to enable us to perform, with great facility, any work outside the ships. I was not sorry, therefore, to commence upon some of the occupations more immediately connected with the equipment of the ships for sea, than those to which we had hitherto been obliged to have recourse as mere employment. We, therefore, began this day to collect stones for ballast, of which it was calcu-

lated that the Hecla would require, in the spring, nearly seventy tons, besides twenty tons of additional water, to make up for the loss of weight by the expenditure of provisions and stores. These stones were brought down on sledges about half a mile to the beach, where they were broken into a convenient size for stowage, and then weighed in scales, erected on the beach for the purpose; thus affording to the men a considerable quantity of bodily exercise, whenever the weather would permit them to be so employed. 1820. Febr.

As we were now, however, approaching the coldest part of the season, it became more essential than ever to use the utmost caution in allowing the men to remain for any length of time in the open air, on account of the injury to their general health, which was likely to result from the inactivity requisite to the cure of some of the most trifling frost-bites. Mr. Edwards has favoured me with the following brief account of such cases of this nature as occurred on board the Hecla:—"The majority of the men who came into the sick-list, in consequence of frost-injuries during the severity of the winter, suffered mostly in their feet, and especially in their great toes; and, although none of them were so unfortunate as to lose a toe, yet few cures were effected without the loss of the nail and cuticle, in which the vital power was invariably destroyed. The exfoliation of these dead parts was always slow, and often attended with small ulcerations at the extremity of the toe. The comparatively languid action which is always going on in the feet, owing to their dependent situation, and their remoteness from the centre of circulation, is much increased by the rigour of so severe a climate, and also by the state of inactivity in which it is necessary to keep the patient; so that these trifling sores were found to heal with extreme difficulty. Occasional negligence and irregularities in the patients also served at times to protract the cure. It may further be observed, that the ulcerations alluded to seldom took place, even in some of the more severe cases, when circumstances would allow of timely attention being paid to them."

On the 8th, at noon, and for half an hour after, an appearance presented itself in the heavens, which we had not before observed. A thin fleecy cloud of a pale-red colour, and shaped like part of an arch, commenced pretty strongly from the top of the land in the N.W., and ran more and more faintly to N.b.W., beyond which it could no longer be traced: it was here fifteen degrees above the northern horizon. On looking for a continuation of it in the opposite quarter of the heavens, we perceived a larger portion of another and fainter arch, of pale, red, or orange, commencing at the horizon in the Tues. 8.

1820. Febr. E.b.N., and extending to 60° of altitude in the N.N.E., so as evidently not to form a part of the western arch. Captain Sabine afterwards observed the whole phenomenon to alter its position, the leg of the eastern arch shifting considerably more to the southward. In the evening the Aurora Borealis was seen, forming a confused and irregular arch of white light, continually varying in brightness, about 8° high in the centre, and extending from S.b.E., round by the west, to N.N.W. From the upper part of this arch, coruscations occasionally shot upwards, and a few streamers now and then burst forth also from the horizon in the S.S.E.; these latter went nearly up to the zenith, while the rest were more faint, and did not reach so high. I am confident, that Aldebaran and the Pleiades were very sensibly dimmed by the most vivid of the coruscations, which appeared, in this respect, not to differ from any thin vapour or cloud floating in the atmosphere. The gold leaf of the electrometer, as well as the magnetic needle suspended in the observatory, was carefully attended to, but neither of them suffered any sensible disturbance.

Wed. 9. Early on the following morning, the wind increased from the N.N.W., and continued to blow a strong breeze from that quarter, with a heavy snow-drift,
Thur. 10. till towards noon, on the 10th. At a quarter past six P.M., on that day, the Aurora began to appear in the south and S.W., in detached, and not very brilliant pencils of rays darting upwards from near the horizon. Soon after, an arch of the usual broken and irregular kind appeared in the western quarter of the heavens, extending from N.W. to south, and being from 5° to 8° high in the centre. From the upper part of the arch proceeded a few faint coruscations reaching to no great height. At a quarter before seven, a second and better-defined arch crossed over from S.E. to N.W.b.N., passing on the northern side of the zenith, from which it was distant from 10° to 15° in the centre. This arch was very narrow, and seemed to be formed of two parts, each shooting with great rapidity from those parts where the legs stood, and joining in the centre. In a short time this second arch entirely disappeared, and the first became less brilliant. The phenomenon was then for some minutes confined to some bright pencils of rays in the south and S.S.E., which were generally parallel to each other, but sometimes also diverged at an angle of about 15°. At a quarter past seven, two long and narrow streams of light crossed over at 35° to 40° of altitude, on the western side of the zenith, from the N.W.b.N., and south points of the horizon; their upper ends did not quite meet in the centre, so as to complete

an arch, but inclined to the shape of shepherds' crooks, as described on the 15th of January, and often remarked by former observers; but they were neither so brilliant nor so well-defined as when we saw them before. About a quarter before eight, as we were returning on board from the observatory, the low arch to the westward first described, and which had never altogether disappeared, increased considerably in brilliancy. It was still, however, so irregular as to appear in detached roundish clouds or blotches, from which the pencils, which shot upwards, appeared immediately to proceed. These pencils, which were infinitely varied both in length and breadth, were observed to have also a slow, though very sensible lateral motion from north to south, and *vice versâ*; and we remarked on one occasion that, when two of them met, and had the appearance of overlapping, they produced, for about fifteen seconds, the most intense degree of light we had yet seen from the Aurora. The pencils appeared generally to travel bodily in one direction, but sometimes to widen out in both at the same time. We were all decidedly of opinion, that the fixed stars were very perceptibly dimmed by this phenomenon, which gradually disappeared by nine o'clock. 1820. Febr.

It was a source of much satisfaction to find, at noon to-day, that the sun, even with one degree of meridian altitude, had some power to affect the mercury in the thermometer, which rose from $-40°$ to $-35°$ when exposed to its rays; and, as the sun gradually declined, it fell again to $-40°$ in an hour or two. Frid. 11.

The distance at which sounds were heard in the open air, during the continuance of intense cold, was so great as constantly to afford matter of surprise to us, notwithstanding the frequency with which we had occasion to remark it. We have, for instance, often heard people distinctly conversing, in a common tone of voice, at the distance of a mile; and to-day I heard a man singing to himself as he walked along the beach, at even a greater distance than this. Another circumstance also occurred to-day, which may perhaps be considered worthy of notice. Lieutenant Beechey, and Messrs. Beverly and Fisher, in the course of a walk which led them to a part of the harbour, about two miles directly to leeward of the ships, were surprised by suddenly perceiving a smell of smoke, so strong as even to impede their breathing, till, by walking on a little farther, they got rid of it. This circumstance shews to what a distance the smoke from the ships was carried horizontally, owing to the difficulty with which it rises at a very low temperature of the at-

1820. Febr. mosphere. The appearance which had often been taken for the loom of distant and much refracted land in the south and S.b.E., was again seen to-day, having the same abrupt termination at the latter bearing as before. At half-past eight P.M., the Aurora Borealis made its appearance for a short time, in an arch, very irregular, but at times very bright, from S.W. to S.S.E., at 4° or 5° above the horizon in the centre.

Sat. 12. It may perhaps be attributed to the long absence of the sun which we had lately experienced, and which may have disqualified us from forming a correct judgment, that we considered the orange and lake tints with which the sky was painted about this period, for two hours before and after noon, to be more rich and beautiful than any thing of the kind we had ever before seen. The few fleecy clouds which at any time make their appearance in the heavens during the winter-months of this climate, had to-day, as before observed on the 8th, a tendency to form arches both in the northern and southern quarters, extending from east to west, at 10° of altitude in the north, and 5° or 6° in the south. A thermometer placed in the sun at noon rose quickly from −42° to −30½° on board, the temperature of the atmosphere at the house being 45°, and the weather calm and clear.

Sun. 13. At three A.M., on the 13th, on a light breeze springing up from the southward, the thermometer was observed to rise immediately from −40° to −37°. For a short time before and after noon, a parhelion was seen at the angular distance of 22° 30′ on each side of the sun, at the same altitude with the latter; these parhelia were of a confused shape, but strongly prismatic. There was at the same time, also, a column of bright yellow light proceeding from the sun to the horizon, of the same diameter as that object.

Mon. 14. I have before remarked, that, in consequence of a comparatively warm atmosphere which was always floating around the ships, the thermometer on board, by which the temperature was noted every two hours, usually stood from 2° to 5° higher than that fixed on shore, in consequence of which circumstance, the whole of the temperatures, in our Meteorological Journals, may be taken at least 2° or 3° lower than those actually registered, except in a few instances, which are there expressly noticed. The temperature of the atmosphere having now fallen below the usual standard, it became interesting to watch this difference more minutely, and at six A.M., on the 14th, the thermometer at the house was at −52°, that on board being at −48°, at which time the smoke from the funnels rose very freely, with the mercury

in the barometer standing at 29.53 inches. This additional decrease in the temperature of the atmosphere caused a repetition of that cracking of the ship's timbers which had before occurred, but which had ceased for some time past. At noon the thermometer in the shade rose one degree, and at two P.M., fell again to −52°. 1820. Febr.

Two of the Hecla's marines having been guilty of drunkenness the preceding night, an offence which, under any circumstances, it was my duty to prevent, but which, if permitted to pass unnoticed, might, in our present situation, have been attended with the most serious consequences to our health as well as our discipline, I was under the necessity of punishing them this morning with thirty-six lashes each; being the first occasion on which I had considered it necessary to inflict corporal punishment during thirteen months that the Hecla had been in commission, a fact which I have much satisfaction in recording, as extremely creditable to her crew.

From four P.M. on the 14th, till half-past seven on the following morning, Tues. 15. being an interval of fifteen hours and a half, during which time the weather was clear and nearly calm, a thermometer fixed on a pole, between the ships and the shore, never rose above −54°, and was once during that interval, namely, at six in the morning, as low as −55°. This low temperature might, perhaps, have continued much longer, but for a light breeze which sprung up from the northward, immediately on which the thermometer rose to −49°, and continued still to rise during the day, till at midnight it had reached −34°. During the lowest temperature above mentioned, which was the most intense degree of cold, marked by the spirit thermometer, during our stay in Winter Harbour, not the slightest inconvenience was suffered from exposure to the open air, by a person well clothed, as long as the weather was perfectly calm; but, in walking against a very light air of wind, a smarting sensation was experienced all over the face, accompanied by a pain in the middle of the forehead, which soon became rather severe. We amused ourselves in freezing some mercury during the continuance of this cold weather, and, by beating it out on an anvil, previously reduced to the temperature of the atmosphere; it did not appear to be very malleable when in this state, usually breaking after two or three blows from the hammer.

The increased length of the day, and the cheering presence of the sun for several hours above the horizon, induced me, notwithstanding the severity of the weather, to open the dead-lights of my stern-windows, in order to admit the day-light, of which, in our occupations below, we had entirely been

1820. Febr. deprived for more than four months. I had soon, however, occasion to find that this change was rather premature, and that I had not rightly calculated on the length of the winter in Melville Island. The Hecla was fitted with double windows in her stern, the interval between the two sashes being about two feet; and within these some curtains of baize had been nailed close, in the early part of the winter. On endeavouring now to remove the curtains, they were found to be so strongly cemented to the windows by the frozen vapour collected between them, that it was necessary to cut them off, in order to open the windows; and from the space between the double sashes we removed more than twelve large buckets full of ice, or frozen vapour, which had accumulated in the same manner.

Wed. 16. About noon, on the 16th, a parhelion faintly prismatic, appeared on each side of the sun, continuing only for half an hour. Notwithstanding the low temperature of the external atmosphere, the officers contrived to act, as usual, the play announced for this evening; but, it must be confessed that it was almost too cold for either the actors or the audience to enjoy it, especially for those of the former who undertook to appear in female dresses. We were fortunate, however, in having the weather moderate as to wind, during our performance; for, on its freshening up soon after to a strong gale from the N.W., which, together with a heavy snow-drift, continued the whole of the

Thur. 17. following day, the thermometer did not rise higher than $-36°$; a change that made the Hecla colder in every part below than she had ever been before. The temperature of the lower deck now fell to $+31°$ for the greater part of the day, that of the coal-hole to $+15°$, of the spirit-room to $+23°$, and of my cabin, as low as $+7°$ during the night, by which the chronometers, Nos. 25 and 369, of Arnold were stopped. Much as I regretted this circumstance, it was impossible to prevent it without such an increase in the quantity of fuel as our resources, when calculating upon the chances of spending another winter in these regions, would by no means admit. Captain Sabine and myself, therefore, agreed, that it was better to let these watches remain down, during the continuance of the severe cold, which was accordingly done.

The intense cold now experienced on board the Hecla, seems to have arisen principally from my having prematurely uncovered the stern windows, which I had been induced to do, not less from the impatience which I felt to enjoy the cheering rays of the sun for eight hours of the day, than on account of the saving of candles, the expenditure of which

had hitherto been much greater than we could well afford. In the constant hope that each succeeding day would produce some amendment in the weather, we endeavoured contentedly to put up with the cold, which, however, continued to be so intense in the cabin for several weeks after this, that it was impossible to sit there without being warmly wrapped up; and it was not uncommon for us, at this period, to reverse the usual order of things, by throwing off our great coats when we went on deck to warm ourselves by exercise (the only mode we had of doing so), and immediately resuming them on coming below. On many of these occasions I have seen a thermometer placed at our feet, standing the whole day under +19°, and sometimes lower, while another, suspended in the upper part of the cabin would, at the same time, indicate 32° or 34°, but seldom higher than this. We had, about this time, two cases of lumbago and one of diarrhœa added to the sick list, which Mr. Edwards considered to have been brought on by the coldness of the decks below; in one of these cases, some scorbutic symptoms subsequently appeared, which yielded without much difficulty to the usual remedies. Mr. Scallon had, before this time, completely recovered. The bed-places continuing very troublesome, from the accumulation of ice in them, several of the men were ordered to sleep in hammocks, which are much more warm and comfortable; but they had been so long accustomed to the bed-places, that there was, in this respect, a good deal of prejudice to overcome among them. 1820. Febr.

At half-past ten P.M. on the 19th, the Aurora Borealis was seen, as described by Lieutenant Beechey, "in bright coruscations, shooting principally from the S.b.W. quarter across the zenith to N.N.E., and partially in every part of the heavens. The light, when most vivid, was of a pale yellow, at other times white, excepting to the southward, in which direction a dull red tinge was now and then perceptible. The coruscations had a tremulous waving motion, and most of them were crooked towards the E.N.E. The fresh gale which blew at the time from the N.N.E., appeared to have no effect on the Aurora, which, as before observed, streamed directly to windward, and this with great velocity. The brighter part of this meteor dimmed whatever stars it passed over, even those of the first magnitude; and those of the second and third magnitude, so much as to render them scarcely visible. The wind blew too strong for the electrometer to be used, but Kater's compass was not in the slightest degree affected. The whole of the phenomenon disappeared in about three quarters of an hour." Sat. 19.

1820. Febr. Tues. 22. On the 22d, the weather was fine and clear, and though the thermometer continued from − 34° to − 36° in the shade, and only rose to − 23½° in the sun at two P.M., the walking was unusually pleasant to our feelings. With our present temperature, the breath of a person, at a little distance, looked exactly like the smoke of a musket just fired, and that of a party of men employed upon the ice to-day resembled a thick white cloud.

Thur. 24. The weather was still fine and clear overhead on the 24th, but there being a moderate breeze from the northward which raised a little snow-drift, with the thermometer from − 43° to − 44° during the day, it was very severe in the open air. At a quarter past ten, while the men were running round the decks for exercise, and were on that account fortunately well-clothed, the house on shore was discovered to be on fire. All the officers, and men of both ships, instantly ran up to extinguish it; and having, by great exertion, pulled off the roof with ropes, and knocked down a part of the sides, so as to allow snow to be thrown upon the flames, we succeeded in getting it under, after three quarters of an hour, and fortunately before the fire had reached that end of the house where the two clocks, together with the transit, and other valuable instruments, were standing in their cases. Having removed these, and covered the ruins with snow, to prevent any remains of fire from breaking out again, we returned on board till more temperate weather should enable us to dig out the rest of the things, among which nothing of any material consequence was subsequently found to have suffered injury; and, having mustered the ships' companies to see that they had put on dry clothes before going to dinner, they were employed during the rest of the day in drying those which had been wet. The appearance which our faces presented at the fire was a curious one, almost every nose and cheek having become quite white with frost-bites in five minutes after being exposed to the weather; so that it was deemed necessary for the medical gentlemen, together with some others appointed to assist them, to go constantly round, while the men were working at the fire, and to rub with snow the parts affected, in order to restore animation. Notwithstanding this precaution, which, however, saved many frost-bites, we had an addition of no less than sixteen men to the sick-lists of both ships in consequence of this accident. Among these there were four or five cases which kept the patients confined for several weeks; but John Smith, of the artillery, who was Captain Sabine's servant, and who, together with Serjeant Martin, happened to be in the house at the time the fire broke out, was unfortunate enough to suffer much more

severely. In their anxiety to save the dipping-needle, which was standing close to the stove, and of which they knew the value, they immediately ran out with it; and Smith, not having time to put on his gloves, had his fingers in half an hour so benumbed, and the animation so completely suspended, that on his being taken on board by Mr. Edwards, and having his hands plunged, into a basin of cold water, the surface of the water was immediately frozen by the intense cold thus suddenly communicated to it; and, notwithstanding the most humane and unremitting attention paid to them by the medical gentlemen, it was found necessary, some time after, to resort to the amputation of a part of four fingers on one hand and three on the other. 1820. Febr.

ASIATIC SOCIETY MUMBAI

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *February*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	−17	−26	−20.87	29.88	29.82	29.850	S.b.E.	Light breezes and hazy.
2	27	38	31.75	29.92	29.86	29.902	S.E.	Ditto ditto.
3	35	44	39.58	30.01	29.92	29.963	Round the Compass.	Ditto and fine clear weather.
4	37	44.5	39.96	30.02	29.97	30.005	N.N.W.	Light airs to fresh breezes.
5	20	37	29.12	29.89	29.75	29.817	N.N.W.	Moderate and hazy.
6	18	23	20.71	29.69	29.64	29.602	W.b.N.	Light breezes and hazy.
7	20	30	24.62	29.75	29.75	29.750	W.N.W.	Light breezes and fine.
8	27	32	28.92	29.81	29.75	29.785	Round the compass.	Light airs and fine.
9	23	28	25.83	29.68	29.57	29.612	North.	Fresh breezes and hazy with drift.
10	26	40	31.62	29.64	29.50	29.565	North.	Strong breezes—P.M. moderate.
11	38	42	39.77	29.70	29.47	29.605	N.N.W.	Light airs and fine clear weather.
12	39	44	42.00	29.34	29.32	29.330	Calm.	Fine clear weather.
13	37	40.5	41.58	29.35	29.32	29.338	North to E.S.E.	Light airs and hazy.
14	38	48	46.33	29.60	29.53	29.627	West	Light winds and very fine weather.
15	32	50	40.92	29.77	29.69	29.720	North.	Ditto ditto.
16	29	36	32.53	30.02	29.75	29.887	N.N.W.	Ditto and hazy weather.
17	26	39	33.42	30.08	30.01	30.053	N.N.W.	Fresh gales and heavy drift.
18	24	28	26.25	29.96	29.87	29.920	N.N.W.	Ditto ditto.
19	19	24	21.04	29.77	29.60	29.698	North.	Ditto. ditto
20	23	26	24.08	29.58	29.53	29.555	North.	Fresh breezes with drift.
21	25	37	30.25	29.80	29.59	29.721	North.	Moderate and fine.
22	34	41	36.58	29.93	29.83	29.906	East.	Light breezes and fine.
23	35	41	37.67	29.95	29.89	29.903	N.b.W.	Moderate and fine.
24	39	43	40.92	29.99	29.91	29.957	N.b.W.	Ditto. ditto
25	30	38.5	34.54	29.82	29.72	29.755	N.N.W.	Strong breezes with heavy drift.
26	20	29	26.33	29.72	29.70	29.708	N.N.W.	Ditto. ditto.
27	24	32	27.75	29.73	29.67	29.700	North	Fresh breezes and fine.
28	25	32	29.08	29.97	29.75	29.872	North to W.b.S.	Ditto ditto.
29	27	37	29.07	30.15	30.02	30.100	N.N.W.	Moderate and fine clear weather.
	−17	60	−32.19	30.15	29.32	29.769		

REMARK.—The minimum temperature for February, as taken at a distance from the ships, was −55°, the difference between this and the temperature registered on board, arising from the warm atmosphere produced by the fires. On the 14th and 15th of February, a thermometer upon the ice did not rise above −50° for seventeen successive hours.

CHAPTER VII.

MORE TEMPERATE WEATHER—HOUSE RE-BUILT—QUANTITY OF ICE COLLECTED ON THE HECLA'S LOWER DECK—METEOROLOGICAL PHENOMENA—CONCLUSION OF THEATRICAL ENTERTAINMENTS—INCREASED SICKNESS ON BOARD THE GRIPER—CLOTHES FIRST DRIED IN THE OPEN AIR—REMARKABLE HALOS AND PARHELIA—SNOW BLINDNESS—CUTTING THE ICE ROUND THE SHIPS, AND OTHER OCCURRENCES TO THE CLOSE OF MAY.

1820. March. Wed. 1.

BEFORE sun-rise, on the morning of the 1st of March, Lieutenant Beechey remarked so much bright red light near the south-eastern horizon, that he constantly thought the sun was rising, nearly half an hour before it actually appeared; there was a column of light above the sun, similar to those which we had before seen. The day being clear and moderate, a party of men was employed in digging out the things which were buried in the ruins; the clocks were removed on board for examination, and preparations were made to rebuild the house for their reception. Some of our gentlemen who walked to the south-west during the day, observed the snow, in certain parts which were exposed to the sun, to be glazed, so as to be very slippery, as if a partial thaw had taken place. It is, perhaps, requisite to have experienced the anxiety with which we were now beginning to look for some favourable change in the temperature of the atmosphere, to conceive the eagerness with which this information was received, and the importance attached to it in our minds, as the first faint indication of the dissolution of the winter's snow. In the evening the wind freshened from the southward, and before midnight had increased to a strong gale, which is very unusual from that quarter.

The thermometer rose very gradually with the wind which blew strong for Thurs. 2.

1820. March. several hours during the night, but entirely died away between eight and nine A.M. on the 2d. At nine o'clock a parhelion appeared on each side of the sun, at the angular distance of 21° 3 ′, that on the eastern side being bright and prismatic, the other indistinct at first, but becoming as clear as the other as the sun rose higher. They were not seen after ten o'clock until half past one P.M., when they re-appeared for a short time, at the distance of 22°. About two P.M. a very thick kind of haze, or fog, came on, which obscured objects at a mile's distance, and at times much nearer. By us, who anxiously caught at any thing which could be construed into a favourable indication, this fog was hailed with pleasure, as a symptom of returning moisture in the atmosphere.

Sat. 4. On the 4th there were more clouds in the atmosphere, and they were harder and better defined about the edges, than they had been before during the winter: a thermometer in the shade seemed now also to be more affected by the general influence of the sun's rays upon the atmosphere, rising from − 30° to − 24° at noon. At half past eleven A.M. a halo appeared round the sun, at the distance of 22°.17 from it, consisting of a circle nearly complete, and strongly prismatic. Three parhelia, or mock suns, were distinctly seen upon this circle; the first being directly over the sun, and one on each side of it, at its own altitude. The prismatic tints were much more brilliant in the parhelia than in any other part of the circle; but red, yellow, and blue, were the only colours which could be traced, the first of these being invariably next the sun in all the phenomena of this kind which came under our observation. From the sun itself several rays of white light, continuous but not very brilliant, extended in various directions beyond the halo, and these rays were more bright after they had passed through the circle, than they were in the part within it: this phenomenon continued for nearly two hours. The Aurora Borealis was seen faintly near the S.S.W. horizon, for three or four hours before midnight.

Sun. 5. The 5th of March was the most mild and pleasant day we had experienced for several weeks, a light breeze springing up from the southward and eastward, having raised the thermometer gradually from − 26° at four A.M., to − 15° at noon: and, after divine service had been performed, almost all the officers and men in both ships were glad to take advantage of it, by enjoying a long walk upon the neighbouring hills. The weather had been hazy, with light snow and some clouds in the morning; but the latter gradually dispersed after noon, affording us the first day to which we could attach the idea

of spring. As soon as the clouds had allowed the sun to come out, a parhelion appeared on each side of it at the same altitude; that to the westward, which was seen on a thick dark cloud, being bright and prismatic; the other, appearing on the blue sky, being scarcely perceptible. A ray of bright yellow light extended horizontally about 3° or 4° on each side of the parhelia, and also a stripe of prismatic colours from each of them to the horizon. Both these were probably parts of the circles which are frequently seen to accompany these phenomena, and at the intersection of which the parhelia usually appear. 1820. March.

On the 6th, at eight A.M., the thermometer had got up to zero, being the first time we had registered so high a temperature since the 17th of the preceding December. The wind veered gradually from S.S.E., round by west, to north, and at night was remarkably variable and squally, frequently changing, almost instantly, from north to west, and *vice versâ*; sometimes being so light as not to extinguish a naked candle at the gangway, and at others blowing a strong breeze. Squalls of this kind we had not observed before, nor did they occur on any other occasion; we could not perceive any alteration in the thermometer while they lasted. Mon. 6.

We continued to enjoy the same temperate and enlivening weather on the 7th, and now began to flatter ourselves in earnest, that the season had taken that favourable change for which we had so long been looking with extreme anxiety and impatience. This hope was much strengthened by a circumstance which occurred to day, and which, trifling as it would have appeared in any other situation than ours, was to us a matter of no small interest and satisfaction. This was no other than the thawing of a small quantity of snow in a favourable situation upon the black paint work of the ship's stern, which exactly faced the south, being the first time that such an event had occurred for more than five months. The thermometer at this time stood at + 35° in the sun, but no appearance of thawing took place, except in the situation described, and even there, upon the *yellow* paint the snow remained as hard as before. We could perceive, from the top of the north-eastern hill of the harbour, from which we had the most extensive view to the south and east, that a line of hummocks had been thrown up to a considerable height upon the ice, at the distance of six or seven miles from the land, and in a direction nearly parallel to it. It was here probably that the junction of the old and "young" floes had taken place in the autumn, the space between the line of hummocks and the land being occupied by the ice Tues. 7.

1820. March. which this winter had produced, and by the breaking up or dissolution of which we could alone hope to proceed on our voyage.

Advantage was taken of the present mild and pleasant weather, to rebuild the house on shore, which was completed in a few days, when the clocks were replaced in it, in readiness for Captain Sabine to begin his experiments on the pendulum, whenever the season would permit. The observations which we had been enabled to make during the winter were principally confined to lunar distances, and to the altitudes of stars for deducing the apparent time. It was our earnest desire to have obtained a series of observations on the zenith distances of certain stars, in order to determine the amount of atmospherical refraction in these latitudes during the winter season. The only instrument in our possession, however, which was adapted to this purpose was the repeating circle, of which we were unfortunately precluded the use by a number of circumstances not previously anticipated, and which indeed could not easily have occurred to the minds of those accustomed only to make observations in more temperate climates. A particular account of these difficulties being given in another place by Captain Sabine, whose unremitted attention was for some time devoted to the means of overcoming them, I shall only here mention generally, that the principal of them arose from the unequal contraction of the brass and iron, and from the freezing of the oil, by which the instrument was so set fast as to make it impossible to turn it in azimuth; also, from the extreme contraction of the spirits, leaving no bubble by which the level could be read. With respect to the experiments on the pendulum, it was on every account considered advisable to wait for the return of spring, rather than to attempt observations requiring such minuteness, and so uniform a temperature, at a time when the very touch of instruments was painful, and when no observation could be made in the open air, without carefully holding the breath.

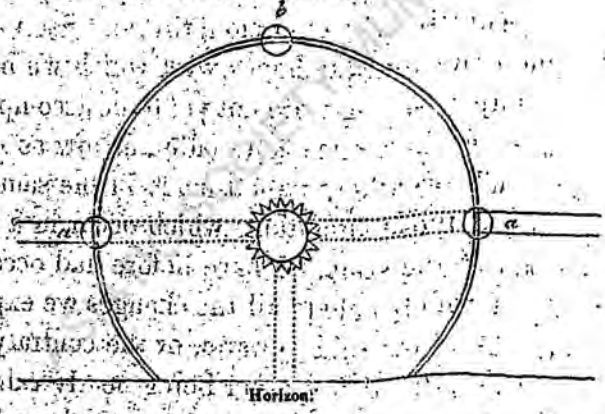
Wed. 8. The severe weather which, until the last two or three days, we had experienced for a length of time, had been the means of keeping in a solid state all the vapour which had accumulated and frozen upon the ships' sides on the lower deck. As long as it continued in this state, it did not prove a source of annoyance, especially as it had no communication with the bed-places. On the contrary, indeed, I had imagined, whether justly or otherwise I know not, that a lining of this kind rather did good than harm, by preventing the escape of a certain portion of the warmth through the ships' sides. The late mildness of the weather, however, having caused a thaw to take place

below, it now became necessary immediately to scrape off the coating of ice; and it will, perhaps, be scarcely credited that we this day removed above one hundred buckets full, each containing from five to six gallons, being the accumulation which had taken place in an interval of less than four weeks. It may be observed, that this vapour must principally have been produced from the men's breath, and from the steam of their victuals during meals, that from the coppers being effectually carried on deck by the screen which I have before mentioned. 1820. March.

James Richardson, a seaman of the Hecla, one of the men who had been attacked by lumbago a short time before, now evinced some symptoms of scurvy, and was, therefore, immediately put on the anti-scorbutic diet. About this time, also, John Ludlow, boatswain's-mate of the Griper, and William Wright, seaman of the Hecla, were attacked in a similar manner; and these two cases subsequently proved the worst of this nature on board the ships. Immediately on the appearance of any complaint among the men, and especially when the symptoms were in the slightest degree scorbutic, the patients were removed to the sick-bay, where the bed-places were larger and more convenient, and where a separate stove was fixed when necessary, so as to make it a warm and comfortable place, apart from the rest of the ships' company.

From ten till eleven A.M. this day, a halo and three parhelia were seen about the sun, in every respect similar to those described on the 4th. About one P.M., there being a fresh breeze from the northward, with some snow-drift, the parhelia re-appeared, being much more bright and prismatic than in the forenoon, and accompanied by the usual halo, which was nearly complete, and whose radius measured $22\frac{1}{2}°$. The parhelia *a*, *a*, in the annexed figure, on each side of the sun, were at times so bright as to be painful to the eye in looking steadfastly at them. When they were brightest, the light was nearly white, and this generally occurred when the wind was most moderate, and when there was consequently less snow-drift. When, on the other hand, the wind and drift increased, they became of a deeper tint, but the red and a pale yellow were the only distinguishable colours, the former being as usual, next the sun. These parhelia were much better resemblances of the sun than any we had seen before, being smaller, more compact and circular, and better defined about their edges, than usual, approaching, in every respect, nearer to that appearance of the sun's disk, which has obtained for them the name of mock-suns. The parhelion *b*, over the sun was never very bright, and the circle of the halo was but faintly tinged with the prismatic colours. Part

1820. March. of a horizontal circle of pale white light passed through the sun's disk, and across the two lower parhelia, being much more bright without than within them. By looking at the sun through a coloured glass, a column of light was seen under it, as often observed before. The brightness of the whole phenomenon varied every instant, on account of the snow-drift.



When this phenomenon had continued about an hour and a half, we perceived a segment of another circle above the first, and inverted with regard to it, as at c, its centre being somewhere near the zenith. The distance from the sun to c was about 54°, as nearly as the indistinctness of the latter would allow of its being measured. The whole disappeared in two hours and a half from its commencement, during which time, the thermometer was from −16° to −20°, and the weather fine and clear over head. From nine P.M., till midnight, the Aurora Borealis appeared faintly in the horizon to the south, occasionally streaming towards the zenith in coruscations of pale white light.

Thurs. 9. On the 9th, it blew a hard gale from the northward and westward, raising a snow-drift, which made the day almost as inclement as in the midst of winter. The wind suddenly ceased in the evening, and while the atmosphere

near the ships was so serene and undisturbed that the smoke rose quite perpendicularly, we saw the snow-drift on the hills at one or two miles' distance whirled up into the air, in columns several hundred feet high, and carried along by the wind, sometimes to the north, and at others in the opposite direction. The snow, thus raised, at times resembled water-spouts, but more frequently appeared like smoke issuing from the tops of the hills, and, as such, was at first represented to me. 1820. March.

On the 12th, Lieutenant Liddon reported another of his seamen to be affected with scurvy, making two in each ship labouring, more or less, under this disease; Mr. Scallon also complained again a little, of feeling, according to his own account, "as if tired with walking;" by attention, however, to the warmth and dryness of his clothing, he gradually recovered his former strength as the season advanced. Sun. 12.

It blew a strong breeze from the N.b.W., with a heavy snow-drift, on the 12th, which continued, with little intermission, till near noon on the 14th; affording us a convincing proof that the hopes with which we had flattered ourselves of the speedy return of spring were not yet to be accomplished. During this time the thermometer had once more fallen as low as − 28°, a change which, after the late mild weather, we felt much in the same manner as we should have done any of those alterations which occur in a more temperate climate, at a higher part of the scale. I have before had occasion to observe that this remark is equally applicable to all the changes we experienced in the course of the winter, either from cold to warm, or the contrary. Tues. 14.

At one P.M., on the 14th, the weather being nearly calm, and the thermometer at + 33° in the sun, there was a second partial melting of the snow upon the ships' stern. Immediately on the springing up of a light breeze, however, the thermometer in the sun fell to + 11°, and at half-past two was at + 6°, the temperature of the air in the shade remaining steadily from − 16° to − 17°. At five P.M., a parhelion was observed on each side of the sun, at its own altitude, and distant from it 22° 10′, with a part of the usual horizontal circle, extending 2° or 3° from the outer edge of each parhelion.

On the 16th, there being little wind, the weather was again pleasant and comfortable, though the thermometer remained very low. While it continued nearly calm, we observed the following differences in the temperature of the air in the shade and in the sun; the latter, were however, noted by a thermometer placed under the ship's stern, which situation was a warm one, for the reasons before assigned. Thur. 16.

1820. March.

A.M.	9	SHADE	− 21°	SUN	+ 24°
	10		− 23°		+ 27°
	11		− 22°		+ 28½°
Noon			− 21°		+ 29°
P.M.	3		− 13°		+ 19°.

This evening, the officers performed the farces of the *Citizen* and the *Mayor of Garratt*, being the last of our theatrical amusements for this winter, the season having now arrived when there would no longer be a want of occupation for the men, and when it became necessary also to remove a part of the roofing to admit light to the officers' cabins. Our poets were again set to work on this occasion, and an appropriate address was this evening spoken on the closing of the North Georgia Theatre, than which we may, without vanity, be permitted to say, none had ever done more real service to the community for whose benefit it was intended.

Mon. 20. Two of the Hecla's seamen, who were employed on shore in digging stones for ballast, reported on the 23th, that they had seen a glaucous gull, or one of that species known to sailors by the name of "burgomaster." On being questioned respecting this bird, they strongly insisted on the impossibility of their having mistaken its kind, having been within twenty yards of it. As, however, these gulls cannot well subsist without open water, of which there was certainly none in the neighbourhood at that period, we conjectured that it might have been an owl; a bird that may, perhaps, remain on the island, even during the whole winter, as the abundance of mice (*Mus Hudsonius,*) of which we constantly saw the tracks upon the snow, would furnish them with an ample supply of food. It was a novelty to us, however, to see any living animal in this desolate spot; for even the wolves and foxes, our occasional visitors during the winter, had almost entirely deserted us for several weeks past.

The sick report of the Griper this day contained no less than ten cases, of which four were scorbutic, while the number of sick, or rather of convalescent, on board the Hecla, did not amount to half that number. On inquiring into the probable cause of this extraordinary proportion of sick on board the Griper, which, just at this period, when their services began to be necessary to our re-equipment, was likely to prove of serious importance, I found, from Lieutenant Liddon, that the beams and bed-places on the Griper's lower-deck had lately been in so damp a state, in consequence of the condensation of the vapour upon them, and in spite of every endeavour to prevent it, that there could be little doubt of the cause to which the present

unhealthiness of the crew was to be chiefly attributed. I, therefore, directed a survey to be held by the three medical officers, and a report to be made of their opinions, as to the expediency of altogether removing the bed-places, or of adopting any other means of obviating the evil in question. These gentlemen were of opinion that the extreme dampness was "occasioned by the necessary proximity of the bed-places to the vessels' sides, and the smallness of the lower-deck, in consequence of which the vapours formed were deposited in so great abundance, particularly during meal-times, that the heat of the fires was inadequate to remove the evil, before the cause was again renewed." They therefore recommended taking down the bed-places, in order to admit a more free ventilation, as well as a more equal distribution of the warmth, and that hammocks should be substituted in their place; an alteration which was immediately adopted. While on this subject, which is so intimately connected with the health of seamen in the Arctic Regions, it may be proper for me to remark that, although the bed-places, which were fitted on board the Hecla and Griper, give a neat and comfortable appearance to the lower-deck, and are in reality a great convenience to the men in many respects, yet that our winter's experience plainly shews them to be so favourable to the accumulation of dampness or ice within them, that there can remain little doubt of their unfitness for this service; and, I believe, that hammocks will be found warmer, and in every respect more comfortable to the men, than any other kind of sleeping-place that could be adopted. To the officers' cabins, which are necessarily closer to the ship's side, the same remark applies still more strongly; and with this difference only, that, on account of the want of length, cots must be used instead of hammocks. The advantage of thus removing from the ship's side was remarkably proved in the case of Lieutenant Liddon, whose state of health was so bad during the winter, that we at one time entertained very serious apprehensions respecting him. It was proposed, therefore, about the end of February, that he should sleep in a cot, at some distance from the side; and, from that period, his recovery was so rapid and so decided, that in a few weeks he was enabled to walk out every fine day in the open air for exercise, with the thermometer at twenty degrees below zero, and without the slightest degree of inconvenience.

1820. March.

On the 23d, we found, by digging a hole in the ice, in the middle of the harbour, where the depth of water was four fathoms and a quarter, that its thickness was six feet and a half, and the snow on the surface of it eight inches deep. This may be considered a fair specimen of the average formation of ice in this

Thur. 23.

1820. March. neighbourhood since the middle of the preceding September; and as the freezing process did not stop for more than six weeks after this, the produce of the whole winter may, perhaps, be reasonably taken at seven, or seven and a half feet. In chopping this ice with an axe, the men found it very hard and brittle till they arrived within a foot of the lower surface, where it became soft and spongy.

Sat. 25. At noon, on the 25th, two thermometers stood

in the shade at	−25°, and in the sun at	+30°
at 1 P.M. -	−22°, - - - - - -	+17°
2 - - -	−22°, - - - - - -	+25°
3 - - -	−22°, - - - - - -	+21°

the thermometer in the sun being placed at a distance from the ship, and the weather very calm and fine. The length of the day had now so much increased,

Sun. 26. that at midnight on the 26th, there was a very sensible twilight in the northern quarter of the heavens; and such was the rapidity with which this part of the season appeared to us to have come round, that we could, with difficulty, picture to ourselves the total darkness from which we had so lately emerged.

Tues. 28. On the 28th, Lieutenant Beechey reported, on his return from a walk over the hills to the westward, that he had seen, even more plainly than before, that refracted appearance in the southern horizon, which bore a strong resemblance to distant land in that direction; and, what is most worthy of notice, still seeming to terminate abruptly about a S.b.E. bearing from Winter Harbour. The thermometer was at this time at −20°, and the mercury in the barometer standing at 30.22 inches.

April. On one of the fine days in the early part of March, in taking a longer walk than usual on the north side of the harbour, we accidentally met with a small flat stone, on which the letter P was plainly engraved. As there seemed little doubt that this had been artificially done, and as, since our arrival in Winter Harbour, the weather had been too cold to induce any of our people to sit down on the ground for the purpose of exercising their talent in this way, we were entirely at a loss to conjecture how it came there, and various amusing speculations were resorted to, in order to account for it. Since that time, the weather had not permitted our sending for it till this day, when it was brought on board; and on inquiry among the men, we found that Peter Fisher, a seaman belonging to the Griper, who was one of the party under Mr. Fife, respecting whom we had felt so much anxiety in the preceding September, had, on that occasion, amused himself by begin-

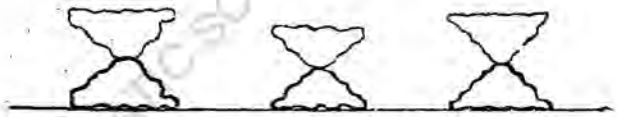
ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *March*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	−25	−40	−31.33	30.16	29.80	30.050	South.	Light airs and fine clear weather.
2	−17	−33	−25.00	29.63	29.52	29.570	South, round by West, to North	Fresh breezes and hazy with drift.
3	−26	−37	−31.33	29.68	29.55	29.625	North	Strong breezes: much drift.
4	−24	−33	−27.92	29.62	29.50	29.575	N.N.W.	Fresh gales to light airs.
5	− 9	−26	−16.50	29.41	29.30	29.378	E.S.E.	Light airs and cloudy—small snow.
6	+2.5	− 8	− 2.50	29.12	29.00	29.050	S.S.E. variable.	Moderate with small snow.
7	+ 2	−15	− 6.17	29.27	29.03	29.172	N.W.	Ditto ditto.
8	−16	−22	−18.35	30.15	29.32	29.762	North	Fresh breezes with drift.
9	− 3	−14	− 8.58	30.13	29.88	29.980	West.	Strong breezes and hazy—P.M. moderate.
10	+ 1	−14	− 4.96	29.78	29.62	29.695	Round the compass.	Variable, from calm to strong breezes.
11	+ 6	−11	− 2.25	29.63	29.30	29.478	West.	Fresh breezes and hazy with drift.
12	−19	−29	−24.00	29.96	29.62	29.822	N.b.W.	Ditto ditto.
13	−10	−27	−22.71	29.97	29.82	29.905	N.b.W.	Ditto ditto.
14	−12	−24	−17.83	29.83	29.62	29.757	North	Ditto ditto.
15	−10	−23	−16.25	29.76	29.50	29.600	North	Ditto ditto.
16	−13	−26	−21.79	29.88	29.76	29.828	N.N.W.	Light airs and fine.
17	−12	−24	−17.58	29.87	29.83	29.857	N.b.W.	Strong breezes with much drift.
18	− 5	−16	− 8.88	29.99	29.78	29.882	North	Fresh gales with heavy drift.
19	−10	−18	−13.75	30.00	29.91	29.965	North	Moderate and clear.
20	−8	−18	−11.88	29.89	29.75	29.805	North.	Light airs with small snow
21	−12	−24	−15.63	29.78	29.63	29.697	N.b.E. North.	Light airs and hazy.
22	− 8	−22	−13.75	29.88	29.72	29.780	North.	Fresh breezes and hazy with drift.
23	−17	−26	−22.42	30.05	29.91	29.997	North	Light airs and fine.
24	−18	−27	−21.50	30.06	29.95	29.995	North	Ditto ditto.
25	−22	−30	−26.71	29.94	29.92	29.927	N.W. North	Ditto ditto
26	−21	−29	−25.50	30.14	29.93	30.005	North	Light to strong breezes.
27	−19	−33	−26.17	30.19	30.03	30.132	North	Light airs to snow.
28	−16	−29	−24.17	30.26	30.19	30.227	N.N.W.	Light breezes and fine.
29	−17	−28	−23.88	30.19	30.14	30.165	N.N.W.	Ditto ditto.
30	−12	−28	−20.29	30.25	30.14	30.212	North	Ditto ditto.
31	− 3	−27	−11.50	30.18	29.89	30.003	N.W.	Ditto and hazy
	+ 6	−40	−18.10	30.26	29.00	29.803		

1820. April. ning to scratch upon the stone in question, the initials of his name*. This circumstance is only worthy of notice, from its proving to how considerable a distance this party had rambled, and how completely they were in error as to the direction in which they had been travelling; the distance between the two places being twenty-five miles. I was in hopes, also, of finding out by this means, the situation of a large lake which Mr. Fife reported having seen, and from which he brought a small fish, of the trout kind; but the more I questioned him and his party, the more I was convinced of the little dependance to be placed on the account of persons circumstanced as they were, and of their utter ignorance as to the part of the island in which the lake was to be found.

In the evening, a parhelion was seen on each side of the sun, and a third above it, as usual, at the angular distance of 22° 20′, the two first being strongly marked by the prismatic colours, and the other very indistinctly.

Early on the morning of the 3d, we observed an effect of refraction very common in seas having much ice. It consists in the images of hummocks of ice, reflected and inverted somewhat in this manner,



in which case, from the apparent shape of these images, the ice is technically said to "tree." This appearance is considered by the Greenland sailors, as an indication of clear water in the direction in which it is seen, which was certainly not the case this morning.

Wed. 5. At nine A.M., on the 5th, the weather being very fine, and the thermometer at −18°, we observed a halo round the sun, which was at times nearly complete. There was, as usual, a parhelion on each side of the sun, at the same altitude, and distinctly prismatic. There was also a third parhelion

* When Mr. Fife and his party returned from that excursion, it was a matter of surprise to us, to see how fresh Fisher was, and how little he seemed to regard what had happened, as any thing out of the common way, of which, indeed, the circumstance just related, is also a proof. When asked, on his first arrival on board on that occasion, what they had lived upon, "Lived upon," said Fisher, dryly, "the Duke of Wellington never lived so well. We had grouse for breakfast, grouse for dinner, and grouse for supper, to be sure!"

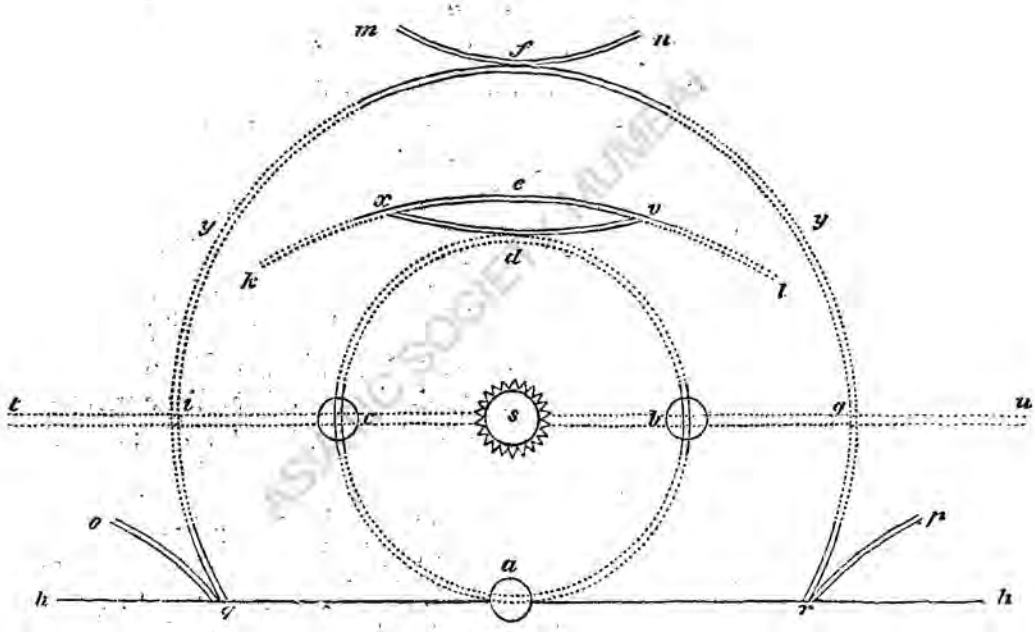
in that part of the circle immediately above the sun, and this had a peculiarity attending it which we had never before observed. Although the weather was remarkably fine and clear, the atmosphere was full of innumerable minute *spiculæ* of snow glittering in the sun, which we had never before seen on a bright sun-shiny day, though we had constant occasion to remark such a deposit, at times when the weather could by no means be called hazy, and when the heavenly bodies were distinctly visible. The parhelion above the sun appeared to be evidently formed by the reflection of the sun's rays to the eye, by an infinite number of these spiculæ, commencing close to the observer, and continuing so as to be easily distinguishable for at least one or two hundred yards from the eye. This parhelion might at times be easily seen to consist of the intersection, or rather the touching, of two circles turning opposite ways, of which the plainest was generally the upper one, or that which had its convex side downwards. At about 22° above the parhelion, being nearly the same distance that the latter was above the sun, a streak of glittering spiculæ was permanently seen in a horizontal direction; but there was so little of it, that it was difficult to say of what regular figure it formed a part. This phenomenon continued above an hour. 1820. April.

Being extremely anxious to get rid, as early as possible, of the drying of our washed clothes upon the lower deck, I had to-day a silk handkerchief washed, and hung up under the stern, in order to try the effect of the sun's rays upon it. In four hours it became thoroughly dry, the thermometer in the shade, being from − 18° to − 6°, at the time. This was the first article that had been dried without artificial heat for six months, and it was yet another month before flannel could be dried in the open air. When this is considered, as well as that during the same period, the airing of the bedding, the drying of the bed-places, and the ventilation of the inhabited parts of the ship, were wholly dependent on the same means, and this with a very limited supply of fuel, it may, perhaps, be conceived in some degree, what unremitting attention was necessary to the preservation of health, under circumstances so unfavourable and even prejudicial.

At midnight, on the 7th, there was light enough to read the thermometer with great ease. On the 8th, the weather was serene and clear; the southern horizon being much raised by refraction, and presenting very strongly the same appearance of land which had so often before been observed in that quarter. A few thin white clouds which were floating in the atmosphere Sat. 8.

1820. April. to-day, had much of that tendency to arch, which has before been described on one or two occasions. Two distinct arches were thus formed this morning one in the northern, the other in the southern hemisphere of the heavens, their altitude in the centre being from 20° to 45°, and joining at each end in the E.N.E. and W.S.W. points of the horizon.

Sun. 9. From half-past six till eight A.M., on the 9th, a halo, with parhelia, was observed about the sun, similar in every respect to those described on the 5th, At one P.M. these phenomena re-appeared, together with several others of the same nature, which, with Captain Sabine's assistance, I have endeavoured to delineate in the annexed figure.



s, the sun, its altitude being about 23°. *h*,*h*, the horizon.

t, *u*, a complete horizontal circle of white light passing through the sun.

a, a very bright and dazzling parhelion, not prismatic.

b, *c*, prismatic parhelia at the intersection of a circle *a*, *b*, *d*, *c*, whose radius was $22\frac{1}{2}°$ with the horizontal circle *t*, *u*.

x, *d*, *v*, an arch of an inverted circle, having its centre apparently about the zenith. This arch was very strongly tinted with the prismatic colours.

k, *e*, *l*. an arch apparently elliptical rather than circular, *e* being distant from the sun 26°; the part included between *x* and *v* was prismatic, the rest white. The space included between the two prismatic arches, *x e v d* was

made extremely brilliant by the reflection of the sun's rays, from innumerable minute spiculæ of snow floating in the atmosphere. 1820. April.

q f r, a circle having a radius from the sun, of 45°, strongly prismatic about the points *f q r*, and faintly so all round.

m n, a small arch of an inverted circle, strongly prismatic, and having its centre apparently in the zenith.

r p, *q o*, arches of large circles, very strongly prismatic, which could only be traced to *p* and *o*; but on that part of the horizontal circle *t u*, which was directly opposite to the sun, there appeared a confused white light, which had occasionally the appearance of being caused by the intersection of large arches coinciding with a prolongation of *r p*, and *q o*.

The above phenomenon continued during the greater part of the afternoon; but at six P.M., the distance between *d* and *e* increased considerably, and what before appeared an arch, *x*, *d*, *v*, now assumed the appearance given in fig. 12, plate 287, of Brewster's *Encyclopædia*, resembling horns, and so described in the article "Halo" of that work. At 90° from the sun, on each side of it, and at an altitude of 30° to 50°, there now appeared also a very faint arch of white light, which sometimes seemed to form a part of the circles *q o*, *r p*; and sometimes we thought they turned the opposite way. In the outer large circle, we now observed two opposite and corresponding spots *y*, *y*, more strongly prismatic than the rest, and the inverted arch *m*, *f*, *n*, was now much longer than before, and resembled a beautiful rainbow.

The protracted length of the winter began now to make us more than usually impatient, and to create in us reasonable apprehensions lest our escape from Winter Harbour should unavoidably be postponed to a period too late for the accomplishment of those sanguine hopes, with which the last year's success had induced us to flatter ourselves. The extraordinary degree of cold which continued day after day was such as we had certainly not anticipated; and when, at this period, with the sun above the horizon for seventeen hours out of the four and twenty, the thermometer was still occasionally falling as low as −31°, which it did at four this morning, it must be confessed that our future prospects of advancement began to wear a very unpromising aspect. It may be imagined, also, with what anxiety we watched for the first appearance of a thaw, both on shore and upon the ice round the ships, in neither of which had any such appearances yet become perceptible, except that here and there, where the snow happened to lie very thin upon the Thur. 12.

1820. April. ground, allowing the sun's rays to penetrate to the earth, a sufficient degree of heat had been radiated partially to thaw the snow, forming it into a thin transparent cake, like a plate of glass. Indeed, the cloudless sky, and the uniformly white surface of sea and land which characterize the climate of Melville Island at this period, are ill calculated to impart warmth to the atmosphere; and it was not till the clouds became gradually more dense and frequent, and the earth, had, by slow degrees, become uncovered in parts, so as to admit the absorption and radiation of heat, that the dissolution of the snow could go on to any considerable extent.

Sun. 16. In the afternoon of the 16th, the weather being clear and nearly calm, Mr. Hooper and myself observed a colouring in some light fleecy clouds, which formed one of the most beautiful phenomena that I had ever seen. These clouds, which were small and white, and almost the only ones in the heavens, assumed, as they approached and passed under the sun, the most soft and exquisite tints of light lake, bluish green, and yellow about their edges, that can possibly be imagined. These tints appeared only when the clouds were within 15° or 20° of the sun, were brightest as they passed under it, which they did as close as 2°, and began to be again indistinct at 10° from it. Some of the clouds remained coloured in this way for upwards of a quarter of an hour; there did not seem to be any regular arrangement of tints, as in the prismatic spectrum, but the lake was always next the sun.

It was a source of extreme satisfaction to me to find that the health of both ships' companies were daily improving as the season advanced; so that by the middle of April the Griper's sick list was reduced to four, all of whom were convalescent; and on board the Hecla, Mr. Edwards had but a single patient, William Scott, boatswain's-mate, who first complained of pneumonia about this time, and whose case subsequently assumed a more dangerous character.

On the 19th and 20th, the thermometer kept up nearly to zero, in consequence of the wind blowing from the E.S.E., and continual snow, of which

Frid. 21. we remarked, when walking on shore on the 21st, that as much had fallen in the last two days as during the whole of the winter. The spiculæ were also much less minute than before, though the snow could not as yet be said to fall in flakes.

Tues. 25. The wind, which had blown fresh from the eastward for several hours, moderated at half past two A.M. on the 25th, and the thermometer fell from + 4° to − 1° at four o'clock. As the wind freshened again, the thermometer

once more rose, and by eight A.M. stood at + 10°. On the two following days Captain Sabine made some observations on the difference in the temperature of the atmosphere in the sun, and in the shade; which shew the effect of the sun's rays much more correctly than those made on board, as it is almost impossible to prevent the thermometer from being affected by the radiation of heat from the ship. "Two posts having been fixed in the snow, at a short distance apart, and connected by a line passing through the shadow cast, by the observatory, about the middle of the day, two mercurial thermometers, being an exact pair, and having their bulbs unprotected, were suspended from the line, one being exposed to the sun, and the other in the shade of the observatory; the bulbs of both were six or eight inches from the snow." 1820. April. Wed. 26.

	h. m.	SUN.	SHADE.	
April 26.	1 30 P.M.	+ 17° ′	+ 6° 5′	
	2 —	22	7	Calm.
	2 13	23	7	
	2 18	24 5	7 6	
	2 35	20 5	6 5	A gentle air.
	2 50	21	6 7	
	6 —	9 5	4 5	
April 27.	11 20 A.M.	15	5	
	11 30	20	7	
	11 40	34	9	
	11 45	23 5	8 5	
	11 55	24	8 5	Almost calm.
	0 25 P.M.	21	7	
	1 —	20	7 5	
	2 20	25	7 7	
	2 45	10	4 5	A breeze sprung up.

The morning of the 27th being very fine, and the thermometer at + 6°, the ship's company's bedding was hung up to air, between the fore and main rigging, being the first time we had ventured to bring it from the lower deck for nearly eight months. While it was out, the births and bed-places were fumigated with a composition of powder mixed with vinegar, and known familiarly by the name of *devils*; an operation which had been regularly gone through once a week during the winter. Thur. 26.

1820. April. This evening, and during the whole night, we experienced, for the first time this season, a fog, such as occurs in more temperate climates, and which the sun dispersed on the following morning; the same thing again occurred the
Frid. 28. next day.

Sat. 29. At half-past two P.M. on the 29th, Mr. Edwards and myself observed the clouds coloured in the same beautiful and delicate manner as on the 16th; except that the tints were now not so vivid, the clouds passing farther from the sun. A parhelion was also seen on each side of the sun horizontally; both were faint and quite white.

I have before mentioned the circumstance of our lower rigging having been very slack during the severity of the winter, and again become tight as the warmer weather came on. Even now this had taken place so effectually, that the rigging was full as tight as when we left the river Thames twelve months before. I have been the more particular in mentioning this fact, because the circumstance of its becoming slack by the cold is at variance with the accounts of other navigators*.

For the last three or four days of April, the snow on the black cloth of our housing had begun to thaw a little during a few hours in the middle of the day, and on the 30th so rapid a change took place in the temperature of the atmosphere, that the thermometer stood at the freezing, or as it may more properly be termed in this climate, the thawing point, being the first time that such an event had occurred for nearly eight months, or since the 9th of the preceding September. This temperature was, to our feelings, so much like that of summer, that I was under the necessity of using my authority to prevent the men from making such an alteration in their clothing as might have been attended with very dangerous consequences. By the annexed Abstract of the Hecla's Meteorological Journal for April, it will be seen how rapid was the change of temperature during this month, the thermometer having ranged from − 32° to + 32° in the course of twenty days. There was, at this period, more snow upon the ground than at any other time of the year, the average depth on the lower parts of the land being four or five inches, but much less upon the hills; while in the ravines a very large

* "On the morning of the 5th, (November,) it was discovered that almost all the shrouds on the starboard side of the ship were broken, which happened from contraction and tenseness, caused by frost."—*Account of Bering's Voyage*, A. D. 1741, Burney's *North-Eastern Voyages of Discovery*, p. 171.

quantity had been collected. The snow at this time became so soft, from the influence of the sun upon it, as to make walking very laborious and unpleasant. 1820. April.

This rapid change in the temperature of the atmosphere again revived our hopes of a speedy departure from Melville Island; and such were the sanguine expectations which animated us at this period, that I believe there was not an officer or man, on board either of the ships, who had not made up his mind to the probability of our leaving Winter Harbour by the middle or latter part of June.

The fine and temperate weather with which the month of April had concluded, induced Captain Sabine to set the clocks going, in order to commence his observations for the pendulum, and he now took up his quarters entirely on shore for that purpose. On the first of May, however, it blew a strong gale from the northward, which made it impossible to keep up the desired temperature in the house; and so heavy was the snow-drift, that in a few hours the house was nearly covered, and we were obliged to communicate with Captain Sabine and his attendants through a small window, from which the snow was, with much labour, cleared away, the door being quite inaccessible. We saw the sun at midnight for the first time this season. May. Mon. 1.

The gale and snow-drift continued on the following day, when we had literally to dig out the sentries, who attended the fire at the house, in order to have them relieved. I feel it right to mention these circumstances, that the difficulties with which Captain Sabine had to contend, may be duly appreciated in the making of observations that require, even under every favourable circumstance of weather and climate, no ordinary share of skill and attention. Tues. 2.

The day being moderate and fine on the 3d, we perceived that the late gale had almost entirely uncovered the higher parts of the land, the snow being blown into the ravines and hollows. We remarked, in the forenoon, that the clouds had a tendency to form two distinct arches across the heavens from N.N.E. to S.S.W., joining at the horizon, but separating gradually on each side of the zenith, to the distance of 8° or 10° from each other. At ten P. M. a parhelion was seen on each side of the sun, at the usual distance, and slightly tinged with the prismatic colours. Wed. 3.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *April*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches	inches	inches.		
1	— 0	—10	— 6.33	30.02	30.01	30.013	N.W.	Light breezes and cloudy: snow.
2	— 2	—25	— 8.37	30.02	29.89	29.955	Round the compass.	Light and variable with snow.
3	— 9	—26	—18.71	29.81	29.79	29.798	North.	Light airs and fine.
4	— 8	—26	—14.75	29.86	29.83	29.843	North.	Ditto ditto.
5	— 5	—21.5	—16.62	30.00	28.86	21.908	W.N.W.	Ditto ditto.
6	—15	—25	—18.75	30.01	29.96	29.983	N.N.W.	Fresh breezes with drift.
7	—13	—26	—21.00	30.00	29.89	29.940	N.W.	Moderate and fine.
8	— 3	—29	—20.46	29.87	29.84	29.855	North.	Light airs and fine.
9	—14	—30	—21.85	29.88	29.83	29.850	S.E.	Ditto ditto.
10	—12	—32	—22.06	29.80	29.70	29.730	North.	Ditto ditto.
11	—12	—27	—19.67	29.68	29.57	29.620	North.	Ditto ditto.
12	—11	—29	—20.00	29.64	29.52	29.565	North.	Ditto ditto.
13	—15	—31	—22.92	29.85	29.67	29.768	N.byW. to South.	Ditto ditto.
14	—14	—29	—19.37	29.95	28.89	29.032	N.N.E. to S.S.E.	Ditto ditto.
15	+ 6	—17	— 7.33	29.72	29.40	29.543	E.S.E.	From fresh to light breezes.
16	— 5	—19	—12.33	29.90	29.57	29.770	N.N.W.	Light breezes and clear.
17	— 5	—21	—13.62	30.26	29.94	30.127	Round the compass.	Ditto ditto.
18	— 1	—15	— 8.17	30.32	30.23	30.288	Calm.	Clear weather.
19	+ 2	—13	— 4.00	30.28	29.92	30.052	E.S.E.	Light airs and fine.
20	+ 4	— 9	— 2.21	29.76	29.67	29.697	East.	Fresh breezes: snow and drift.
21	+ 3	—10	— 3.17	29.96	29.70	29.837	N.N.W.	Moderate and fine.
22	0	—12	— 4.63	30.00	29.97	29.987	North.	Fresh breezes and hazy.
23	+13	— 5	+ 4.00	29.89	29.63	29.756	N.N.E.	Fresh breezes with drift.
24	+14	+ 4	+10.42	29.71	29.67	29.692	East.	Fresh breezes with snow and drift.
25	+14	— 7	+ 4.88	30.20	29.70	29.970	East to S.S.W.	Moderate with snow and drift.
26	+11	—12	— 1.17	30.55	30.25	30.380	North.	Light airs and fine weather.
27	+ 9	—12	+ 0.08	30.86	30.66	30.803	North to S.E.	Ditto ditto.
28	+15	— 5	+ 4.88	30.79	30.46	30.607	Round the compass.	Ditto ditto.
29	+32	+ 3	+12.75	30.66	30.43	30.555	North.	Light airs with snow.
30	+32	+ 6	+30.28	30.67	30.34	30.505	N.W.	Ditto ditto
	+32	—32	— 8.37	30.86	29.40	29.978		

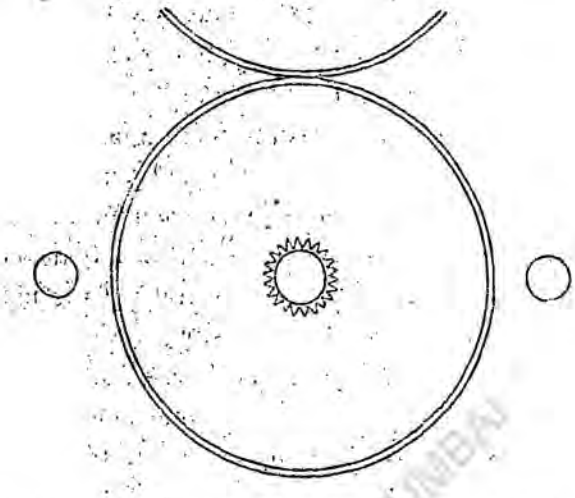
Being desirous of making some observations on the height and time of the tides, I directed a hole to be cut through the ice under the ship's stern, and a pole, graduated in the upper part to feet and inches, dropped through it, and securely moored by a heavy weight to the bottom. Our observations commenced this afternoon, and the height indicated by the pole was registered every hour in the Hecla's log-book. An abstract of the Tide-table, together with such remarks as I have been enabled to make on this subject, will be given hereafter. The snow which we had in the autumn banked up against the ships' sides was now cleared away, in readiness for cutting the ice round them, an operation which I was anxious to perform previously to our making any alterations in the quantity or distribution of the weight in our holds, lest the ships should receive any injury from doing so, in their present confined situation. It is of course not easy to judge in what degree the banking up of the snow had been serviceable in retaining the warmth within the ships, but there can be little doubt that it produced a considerable effect in this way, as well perhaps as in lessening, in some measure, the thickness of the ice which formed around them. 1820. May. Thurs. 4.

On the 5th Mr. Edwards reported that Mr. Crawford, the Greenland mate, who had, for several days past, been complaining of pains which appeared to be rheumatic, shewed some symptoms of the scurvy, which made it necessary to resort to the antiscorbutic diet. It is worthy of notice, that Mr. Crawford was one of the most clean, temperate, and cheerful men in the expedition, and, as such, was one of the least likely to be thus affected. The washed clothes of the ships' company were this day dried entirely in the open air. Frid. 5.

On the 6th, the thermometer rose no higher than + 8½° during the day; but, as the wind was moderate, and it was high time to endeavour to get the ships once more fairly afloat, we commenced the operation of cutting the ice about them. In order to prevent the men suffering from wet and cold feet, a pair of strong boots and boot-stockings were on this occasion served to each, being part of a complete suit of warm clothing, with which I had been supplied for the purpose of issuing them to the ship's companies gratis, whenever I should see occasion. As the sun became low towards midnight, the usual parhelia appeared about this luminary. Sat. 6.

At half-past nine A.M., on the 10th, Lieutenant Beechey observed a halo round the sun, consisting of a complete circle, and an arch of another, touching the first in the part immediately above the sun, and having its Wed. 10.

1820. May. centre apparently from 40° to 50° from that object. There were two parhelia faintly prismatic as usual, but about 3° without the circle.



This phenomenon was remarkable, on account of the parhelia not being situated upon the halo, as was usually the case. It now occurred to me, that on the preceding day, when the same phenomenon had been faintly seen, Mr. Nias, whom I directed to measure the angular distance between the parhelia and the sun, had reported it to be 24° 40′, the radius of the halo being 22½° as usual. This I considered to have been an unavoidable error in the measurement of an ill-defined object; but, on repeating it, his first report was found to be correct. On the present occasion, Lieutenant Beechey saw it for so short a time as not to allow him to measure the distance.

The expedition having, at its departure from England, been victualled for no more than two years, of which one had now expired, I considered it expedient, as a matter of precaution, to reduce the daily allowance of all the kinds of provision to two-thirds of the established proportion, which regulation accordingly took place from this day. The cheerfulness with which this reduction was received by both officers and men, was to me an additional and highly-gratifying proof of that firm and zealous principle of duty by which their conduct was at all times regulated.

Frid. 12. On the 12th, one of the men, employed in digging turf on shore, reported that he had seen a ptarmigan, an event which, trifling as it was, created no small degree of interest among us, who had now been deprived of fresh meat for nearly six months; it was also hailed as a sure omen of returning

summer. This was further confirmed by Mr. Beverly having on the 13th killed a male ptarmigan, and by another being seen on the following day, as well as the first tracks of rein-deer and musk-oxen, which indicated their route to be directly to the northward. The time of the return of these animals to Melville Island, from the continent, is thus satisfactorily ascertained; and it was suggested by Captain Sabine, as a circumstance worthy of remark, that the period of their migration had occurred with the first fine weather which took place after the commencement of constant day-light. In examining the seeds and small buds contained in the maw of the bird killed by Mr. Beverly, they were found to consist entirely of the native plants of the island, and principally those of the dwarf-willow, so that the bird had perhaps arrived a day or two before that time. On the 15th, two or three coveys of ptarmigan were seen, after which they became more and more numerous, and a brace or two were almost daily procured for the sick, for whose use they were exclusively reserved. As it was of the utmost importance, under our present circumstances, that every ounce of game which we might thus procure, should be served in lieu of the other meat, I now renewed the orders formerly given, and which afterwards obtained among us the name of "game-laws," that every animal killed was to be considered as public property; and, as such, to be regularly issued like any other kind of provision, without the slightest distinction between the messes of the officers and those of the ships' companies. 1820. May.

Some of our men, having, in the course of their shooting excursions, been exposed for several hours to the glare of the sun and snow, returned at night, much affected with that painful inflammation in the eyes, occasioned by the reflection of intense light from the snow, aided by the warmth of the sun, and called in America, "snow-blindness." This complaint, of which the sensation exactly resembles that produced by large particles of sand or dust in the eyes, is cured by some tribes of American Indians, by holding them over the steam of warm water; but we found a cooling wash, made of a small quantity of acetate of lead mixed with cold water, more efficacious in relieving the irritation, which was always done in three or four days, even in the most severe cases, provided the eyes were carefully guarded from the light. As a preventive of this complaint, a piece of black crape was given to each man, to be worn as a kind of short veil attached to the hat, which we found to be very serviceable; a still more convenient mode, adopted by some of the officers, was found equally efficacious; this

1820. May. consisted in taking the glasses out of a pair of spectacles, and substituting black or green crape, the glass having been found to heat the eyes, and increase the irritation.

The exhalations arising from the earth were about this time observed to be very abundant, producing, during the day-time much of that appearance of waving tremulous motion in distant objects, which the French call *mirage*, and which was usually succeeded by a fog at night, as soon as the atmosphere had become cool.

Tues. 16. During one of these fogs, at four A.M. on the 16th, the sky being perfectly clear in the zenith to 30° of altitude, whilst a dense haze rested on the land and ice, Captain Sabine observed "a haze-bow of distinct and dazzling light, having its edges softened off, and without any appearance of prismatic colouring. The legs of the bow rose out of a bluish haze, the colour of which somewhat resembled that of weak starch; not quite half a circle was complete; the middle of the arch was between 22° and 23° above the land, which is of little elevation, and the legs were 71° apart. The weather was nearly calm, and there had been a considerable deposition of frozen dew throughout the night. Similar phenomena were observed on the mornings of the 20th and 23d, about the same hour."

Wed. 17. On the 17th, we completed the operation of cutting the ice round the Hecla, which was performed in the following manner: The ice alongside the ships was found to be six feet thick, being about eighteen inches less than the average thickness of it in Winter Harbour, owing principally to our having continued to cut it round the ships for some time after the commencement of the winter, and in part, perhaps, to the snow with which it had there been thickly covered. We began by digging a large hole under the stern, being the same as that in which the tide-pole was placed, in order to enter the saw, which occupied us nearly two days, only a small number of men being able to work at it. In the mean time, all the snow and rubbish was cleared away from the ship's side, leaving only the solid ice to work upon; and a trench, two feet wide, was cut the whole length of the starboard side, from the stem to the rudder, keeping within an inch or two of the bends, and taking care here and there to leave a dike, to prevent the water which might ooze into one part from filling up the others in which the men were working. In this manner was the trench cut with axes, to the depth of about four feet and a half, leaving only eighteen inches, for the saws to cut, except in those places where the dikes remained.

The saw being then entered in the hole under the stern, was worked in the usual manner, being suspended by a triangle made of three spars; one cut being made on the outer part of the trench, and a second within an inch or two of the bends, in order to avoid injuring the planks. A small portion of ice being broken off now and then by bars, handspikes, and ice-chisels, floated to the surface, and was hooked out by piecemeal. This operation was a cold and tedious one, and required nine days to complete it. When the workmen had this morning completed the trench within ten or twelve feet of the stern, the ship suddenly disengaged herself from the ice to which she had before been firmly adhering on the larboard side, and rose in the water about ten inches abaft, and nearly eighteen inches forward, with a considerable surge. This disengagement, to which the sailors naturally applied the term "launching," confirmed my supposition, that the ship was held so fast by the ice, as to make it dangerous to alter materially the stowage of the holds, but in a manner the very reverse of what I had apprehended. This circumstance, however, on consideration, it was not difficult to explain. In the course of the winter, the strong eddy winds about the ships had formed round them a drift of snow, seven or eight feet deep in some parts, and, perhaps, weighing a hundred tons; by which the ice, and the ships with it, were carried down much below the natural level at which they would otherwise have floated. In the mean time the ships had become considerably lighter, from the expenditure of several months' provisions; so that, on both these accounts, they had naturally a tendency to rise in the water as soon as they were set at liberty. 1820. May.

The ships being now once more fairly afloat, I directed a strict and careful survey to be commenced of all the provisions and stores of every kind remaining on board each ship, and at the same time the Griper to be supplied with the quantity which the Hecla had stowed for her, amounting nearly to the proportion of every kind for twelve months. In the mean time, a party of hands were occupied in breaking and weighing the stones for ballast, while others were getting out the sails and boats, and our carpenters, armourers, coopers, and sail-makers, having each their respective employments, our little colony now presented the most busy and bustling scene that can be imagined. It was found necessary to caulk every part of the upperworks, as well as all the decks, the seams having been so much opened by the frost, as to require at least one, and in many parts two threads of oakum, though the ship had scarcely ever laboured at all since

1820. May. she was last caulked. I also at this time laid out a small garden, planting it with radishes, onions, mustard and cress; and a similar attempt was made by Lieutenant Liddon: but, notwithstanding every care and attention which could be paid to it, this experiment may be said to have wholly failed, the radishes not exceeding an inch in length by the latter end of July, and the other seeds being altogether thrown away. Not even a single crop of mustard and cress could be thus raised in the open air; and our horticulture was, therefore, once more confined to my cabin, where, at the present mild temperature of the atmosphere, those two vegetables could be raised without any difficulty, and in considerable abundance. I may remark, however, that some common ships' peas, which were sown by our people for their amusement, were found to thrive so well, that, had I been sooner aware of it, a great quantity of the leaves at least of this vegetable might have been grown, which, when boiled, and eaten as greens, would have been no small treat to persons deprived of fresh vegetable substance for more than ten months. It is not improbable also, that, by the assistance of glass, the want of which deprived us of the opportunity of making the experiment, a great deal more might have been done in this way, notwithstanding the miserable climate with which we had to contend.

Sun. 21. About the 21st we began to perceive a daily diminution of the snow upon the land, the brown soil appearing in patches, where hitherto the snow had Mon 22. completely covered it; and on the 22d, in the course of a walk which we took to the Table-hill, to the westward of the ships, we had the satisfaction of being able to fill a pint bottle with water from a small pool of melted snow, having a quantity of sand mixed with it, a circumstance which we always found to favour the thawing process. There cannot, perhaps, be a more striking proof of the extreme severity of the climate of Melville Island than the fact, that this was the first instance we had known of water, naturally in a fluid state when exposed to the atmosphere, and unassisted by artificial means, such as those which I have already described as having occurred in one or two instances under the ship's stern, since the middle of the preceding September, being an interval of more than eight months. The Table-hill, which is seen at a great distance on the coast, in coming from the eastward, and which forms a conspicuous object in this country where there is so little to vary the scene, lies at the distance of five or six miles to the westward of the station of the ships in Winter Harbour. It rises about a hundred feet above the level of the plain on which it stands, the top of it not exceeding in

extent a quarter of an acre of ground. The surface of it consists generally of sand, on which are lying numerous masses of lime-stone, nearly the whole of which, though varying in colour from white to dark brown, have a fetid smell when broken; and many of the specimens contained madrepore. We found here also a quantity of clay iron-stone, which is common in this part of Melville Island, together with pieces of flint, granite, and other substances, which are described in the Appendix. During this excursion, too, we discovered, with pleasure, that the sorrel *(Rumex digynus, Linn.)* was extremely abundant in the neighbourhood of the ships, a root or two of this valuable antiscorbutic plant occurring in almost every tuft of moss which we met with. No appearance of its beginning to vegetate could yet, however, be perceived; and we began to look with impatience for the sprouting of its leaves, from which we hoped to obtain a supply of fresh vegetable matter, of which, perhaps in reality, we all began to stand in need. About two hundred yards to the westward of this hill is another rather smaller, but very similar in appearance, and composed of the same mineral substances as that just described; in coming from the eastward, the second hill is not seen, being hid behind the other. 1820. May.

Having considered that an examination of the extent and productions of the island might be conducive to the improvement of the geography and natural history of these regions, and the good state of health enjoyed by the crews, permitting a certain number of men to be spared from each ship during their equipment for sea, I now determined to undertake a journey into the interior, for this purpose, accompanied by a certain number of officers and men who volunteered their services on the occasion; and the 1st of June was fixed for our departure. The Griper's sick-list had now been reduced to one person, whose only complaint was debility from a late attack of scurvy; and William Scott, whom I have before had occasion to mention, was the only patient on board the Hecla. The case of this man had been such as, for some time past, to baffle Mr. Edwards's endeavours to produce a favourable change, his complaint appearing to be more mental than corporeal, and, therefore, one which no medicine could be expected to cure. Tues. 23.

Previously to my intended departure, I was occupied in measuring a base upon the ice across the mouth of the harbour, and in taking the necessary angles for the survey, which was carried to the eastward beyond Fife's Harbour, principally for the purpose of connecting our observations here with those obtained by Captain Sabine on the 6th of the pre-

1820. May. ceding September, on which the correction of the longitudes observed during the navigation of 1819, in part depended.

Wed. 24. Early on the morning of the 24th, Mr. Allison reported that he had felt a few drops of rain fall upon his face, an event which we had scarcely dared to anticipate so soon, but which was hailed with much satisfaction, as nothing appears to be so effectual as rain in producing the dissolution of the ice. The clouds had a watery appearance throughout the day, and at half-past eight in the evening, we were agreeably surprised by a smart shower of rain which was shortly after succeeded by several others. We had been so unaccustomed to see water naturally in a fluid state at all, and much less to see it fall from the heavens, that such an occurrence became a matter of considerable curiosity, and I believe every person on board hastened on deck to witness so interesting as well as novel a phenomenon. The rain which fell in the course of the evening, made several little pools upon the ice, which now remained unfrozen for twelve or fourteen hours in the day, as did also the sea-water around the ships. Two ivory gulls (*Larus Eburneus*) were reported to have been seen in the course of this day by a party employed in cutting turf on shore.

Sat. 27. I am now to mention an occurrence which took place at this period, and on which I should gladly be silent, but that it is intimately connected with the important subject of the health of seamen in this and in every other climate. It was reported to me, through one or two of the Hecla's petty-officers, that one of our seamen, whose name I am unwilling to record, and who had lately been cured, by the greatest care and attention, of a rather severe attack of the scurvy, had been in the frequent habit of eating with his bread a quantity of the skimmings of the water in which salt meat is boiled, called by the sailors "slush." This kind of fat or grease, which is always understood to be a perquisite of the cooks in His Majesty's navy, and the use of which is well-known to be in the highest degree productive of scurvy, had always been a source of considerable anxiety and apprehension to me during the voyage. Soon after our leaving England, when the issuing of salt-meat commenced, I sent for the cook of the Hecla, and in presence of the officers, warned him on no account ever to permit a particle of this slush to be used by the ship's company; and, on condition of his faithfully complying with this injunction, I permitted him, under certain restrictions, to preserve it in casks, for his own future benefit. With these directions the cook had, I believe, punctually complied till the middle of the winter; when he had been gradually led into a practice of furnishing the people occasionally with a small quan-

tity of fat to burn in their lamps; of this, the man alluded to, had, it seems, taken advantage, and used it as an article of diet in the manner described. Being determined immediately to check so pernicious a practice, I charged him with his offence in presence of the officers and ship's company, pointing out to them, at the same time, the ingratitude with which he had repaid the care taken of him during his late illness. It gave me great satisfaction to find that the men were disposed to view this act with a degree of indignation little short of that which I feel it my duty to express on this occasion, some of them, as I found, having repeatedly spoken to him before upon the subject. Having, therefore, directed that the offender should be punished by wearing upon his back a badge, which would expose him for a time to the contempt and derision of his shipmates, I felt satisfied that no future instance would occur of an offence which might prove so fatal to the cause in which we were engaged. 1820. May.

Early on the morning of the 29th, the wind increased to a fresh gale from the northward and westward, which continued during the day, with a heavy fall of snow and a tremendous drift that prevented our seeing to the distance of more than twenty yards around the ships. The following day being fine, I took my travelling party to the top of the north-east hill, in order to try the cart, which had been constructed for carrying the tents and baggage, and which appeared to answer very well. The view from this hill was not such as to offer much encouragement to our hopes of future advancement to the westward. The sea still presented the same unbroken and continuous surface of solid and impenetrable ice, and this ice could not be less than from six to seven feet in thickness, as we knew it to be about the ships. When to this circumstance was added the consideration, that scarcely the slightest symptoms of thawing had yet appeared, and that in three weeks from this period the sun would again begin to decline to the southward, it must be confessed, that the most sanguine and enthusiastic among us had some reason to be staggered in the expectations they had formed of the complete accomplishment of our enterprise. Mon. 29. Tues. 30.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *May*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	−17	0	+ 8.58	30.48	30.31	30.342	North.	Strong gales to moderate and cloudy.
2	+11	− 1	6.25	30.46	30.39	30.418	North.	Strong breezes and fine.
3	+15	+ 2	9.25	30.42	30.39	30.403	North. N.W.	Moderate and fine.
4	+16	0	7.67	30.41	30.38	30.398	N.N.W.	Moderate and fine.
5	+20	+ 2	11.58	30.36	30.26	30.312	North.	Fresh breezes with drift.
6	+8.5	− 2	3.83	30.21	30.09	30.155	N.N.W.	Strong breezes and fine.
7	+ 5	− 4	0.79	30.06	29.98	30.007	N.N.W. North.	Moderate and fine.
8	+ 8	− 2	3.00	29.99	29.98	29.982	North.	Fresh breezes and fine.
9	+ 9	− 1	4.67	30.03	29.93	29.985	North.	Ditto. ditto
10	+10	+ 1	5.62	30.07	30.00	30.027	North.	Ditto. ditto.
11	+10	−1.5	4.17	30.14	30.06	30.113	North.	Ditto. ditto.
12	+18	− 1	8.62	30.19	30.15	30.168	North.	Light breezes and cloudy.
13	+17	− 1	7.62	30.34	30.19	30.262	N.W.	Ditto. ditto.
14	+17	− 3	7.50	30.41	30.36	30.393	Calm.	Fine clear weather.
15	+19.5	− 1	9.42	30.38	30.26	30.317	Calm.	Ditto. ditto.
16	+24	− 2	12.67	30.23	30.19	30.200	Calm.	Hazy weather.
17	+29	+ 7	18.50	30.24	30.21	30.228	North. N.W.	Light breezes and hazy.
18	+24	+10	18.00	30.31	30.23	30.272	N.W.	Light breezes and fine.
19	+25	+10	17.75	30.27	30.24	30.258	North	Ditto ditto.
20	+26	+10	16.96	30.20	30.10	30.160	South.	Ditto ditto.
21	+29	+ 6	18.83	30.11	29.99	30.025	South.	Ditto ditto.
22	+32	+12	23.00	30.21	30.02	30.102	South.	Ditto ditto.
23	+34	+20	27.29	30.30	30.00	30.193	North to S.S.E.	Moderate breezes and cloudy.
24	+36	+25	32.71	30.12	29.75	29.893	E.S.E.	Fresh breezes and cloudy.
25	+40.5	+32	36.33	29.99	29.74	29.870	N.W.	Moderate and cloudy.
26	+36.5	+30	33.04	30.20	30.00	30.122	S.S.E. by West to N.N.W.	Light winds and fine.
27	+47	+32.5	39.17	30.02	29.93	29.982	South.	Light breezes and cloudy.
28	+37	+33	34.96	29.81	29.27	29.582	East.	Moderate and cloudy with rain, hail and snow.
29	+33	+21	26.54	29.50	29.25	29.402	N.W.	Strong gales and heavy drift.
30	+38	+24	31.08	29.96	29.71	29.853	N.N.W. to W.N.W.	Fresh breezes and fine.
31	+35	+27	30.92	29.98	29.89	29.933	N.E.	Moderate and hazy with small snow.
	+47	− 4	+16.66	30.48	29.25	30.109		

CHAPTER VIII.

JOURNEY ACROSS MELVILLE ISLAND TO THE NORTHERN SHORE, AND RETURN TO THE SHIPS BY A DIFFERENT ROUTE.

THE weather being favourable on the morning of the 1st of June, I made such arrangements as were necessary, previous to my departure on our intended journey. I directed Lieutenants Liddon and Beechey to proceed with all possible despatch in the equipment of the ships for sea, having them ready to sail by the end of June, in order that we might be able to take advantage of any favourable alteration in the state of the ice at an earlier period than present appearances allowed us to anticipate. 1820. June. Thurs. 1.

The party selected to accompany me, out of the numerous volunteers on this occasion, consisted of Captain Sabine, Messrs. Fisher, Nias, and Reid, Serjeant M'Mahon, of the Marines, Serjeant Martin, of the Artillery, and three seamen and two Marines, belonging to both ships, making a total of twelve, including myself. We were supplied with provisions for three weeks, according to the daily proportion of one pound of biscuit, two-thirds of a pound of Donkin's preserved meat, one ounce of salep powder, one ounce of sugar, and half a pint of spirits, for each man. Two tents, of the kind called in the army horsemen's tents, were made of blankets, with two boarding-pikes, fixed across at each end, and a ridge rope along the top, which, with stones laid upon the foot of the blankets, made a very comfortable and portable shelter. These tents, with the whole of the provisions, together with a *conjuror* or cooking apparatus, and a small quantity of wood for fuel, amounting in the whole to eight hundred pounds, were carried upon a strong but light

1820. June. cart, constructed for the purpose; this method having been decided on as the most convenient for the country in which we were about to travel.

Each officer and man was also furnished with a blanket made into a bag, with a drawing string at each end, a pair of spare shoes and stockings, a flannel shirt, and a cap to sleep in. The clothing and blankets were carried on our backs in knapsacks, those of the officers weighing from seventeen to twenty-four pounds each, and one between every two men weighing twenty-four pounds, to be carried for half a day alternately. Mr. Dealey, with a party of three men, was appointed to attend us for the first day's journey, to assist in carrying our baggage, and then to return to the ships. It was my intention to proceed as directly north as possible, and if we came to the sea in that direction, to turn to the westward, making such a circuit in returning to Winter Harbour as might occupy from one to three weeks, according to circumstances. It was proposed to travel entirely at night, if any part of the twenty-four hours could properly now be so called, when the sun was constantly above the horizon. This plan was considered to be advantageous, both for the sake of sleeping during the warmth of the day, and to avoid, as much as possible, the glare of the sun upon the snow while travelling.

At five P.M., we left the ships, accompanied by a large party of officers and men from each, who were desirous of relieving us from the weight of our knapsacks for an hour or two; and, having been cheered by the ships on our departure, we went round the head of the harbour, and ascended the north-east hill. This route was chosen on account of the ground being clear of snow, only on the ridges and higher parts of the land. Our companions left us at eight P.M., and we proceeded across a level plain almost entirely covered with snow, which, however, was so hard as to make the travelling very good; and the cart was dragged along without difficulty. At eleven P.M., we came to three remarkable round hills, composed entirely of sand and masses of sandstone, and halted to dine close to the northward of them. Those parts of the land which were clear of snow, appeared to be more productive than those in the immediate neighbourhood of Winter Harbour, the dwarf-willow, sorrel, and poppy (*Papaver Nudicaule*), being more abundant, and the moss more luxuriant; we could not, however, collect a sufficient quantity of the slender wood of the willow in a dry state, for the purpose of dissolving snow for water, and were, therefore, obliged to use a part of the fuel which we had provided for that purpose. The thermometer stood at 31° at midnight.

Having set off soon after midnight, at the distance of half a mile in a N.b.E. direction, we came to a piece of frozen water half a mile in length, and two hundred yards wide, situated on the south side of the range of hills which bound the prospect from Winter Harbour. The ice, on the surface of this lake or pond, was in some parts nearly dissolved, and in all too soft to allow us to cross it. We here saw a pair of ducks, one of which being white and the other brown, we supposed them to be of that species called king ducks (*Anas Spectabilis.*) We soon after came in sight of an extensive level space to the north-westward, upon which not a single dark spot could be distinguished, even with a glass, to break the uniformity of the snow with which it was covered, till it appeared to terminate in a range of lofty hills which we had occasionally seen from the southward, and which, from the appearance given them by their distance, we had called the Blue Hills. We had, for some time past, entertained an idea, from their bold and precipitous appearance in some parts, that water would be found at the foot of them; and had we not been certain that we had now ascended three or four hundred feet above the level of Winter Harbour, the appearance of the plain before us, which resembled a branch of the sea covered with ice, would have confirmed us in this idea. We halted at half-past six A.M., and pitched the tents on the hardest ground we could find, but it became quite swampy in the course of the day. We killed seven ptarmigan, and saw two plovers (*Charadrius Pluvialis*), and two deer, being the first we had met with this season, with a fawn, so small, as to leave no doubt of its having been dropped since the arrival of the female upon the island. They were so wild as not to allow us to approach them within a quarter of a mile. The day was fine with light and variable airs; the thermometer stood at 34°, in the shade, at seven A.M., at which time it was unfortunately broken. 1820. June. Frid. 2.

At five P.M., we struck the tents, and having detained one of Mr. Dealey's party to accompany us, I despatched him to the ships with the others, and then continued our journey to the northward, having first made the necessary observations for determining our position. These and the rest of our observations for latitude and longitude, obtained during this journey, were made with a sextant and artificial horizon, and the longitudes are by the chronometer, No. 2109 of Arnold, which I carried in my pocket.

As we proceeded to the northward, the delusion respecting the level plain to the westward, began to wear off, some brown spots being here and there perceptible with a glass, which left no doubt of its being principally, if not

1820. June. entirely, land. Beyond this plain, however, there was a piece of bold land in the distance, having every appearance of an island, lying between the Blue Hills on the north, and some high land to the south. There was a bright and dazzling ice-blink over the plain of snow, and exactly corresponding with it, as to extent and position.

Sat. 18. Having halted three hours to dine and rest, we again set forward at two A.M., on the 3d, crossing one or two ravines, running E.N.E. and W.S.W., in which there was a large collection of snow, but as yet no appearance of water in the bottom of them. Captain Sabine and myself being considerably a-head of the rest of the party, had sat down to wait for them, when a fine rein-deer came trotting up, and played round us for a quarter of an hour, within thirty yards. We had no gun, nor do I know that we should have killed it, if we had, there being already as much weight upon the cart as the men could well drag; and having no fuel to spare for cooking; besides, we felt it would have been but an ill return for the confidence which he seemed willing to place in us. On hearing our people talking on the opposite side of the ravine, the deer immediately crossed over, and went directly up to them, with very little caution; and, they being less scrupulous than we were; one or two shots were immediately fired at him, but without effect; on which he again crossed over to where we were sitting, approaching us nearer than before. As soon as we rose up and walked on, he accompanied us like a dog, sometimes trotting a-head of us, and then returning within forty or fifty yards. When we halted, at six A.M., to make the usual observations, he remained by us till the rest of the party came up, and then trotted off. The rein-deer is by no means a graceful animal; its high shoulders and an awkward stoop in its head, giving it rather a deformed appearance. Our new acquaintance had no horns, he was of a brownish colour, with a black saddle, a broad black rim round the eyes, and very white about the tail. We observed that whenever he was about to set off, he made a sort of playful gambol, by rearing on his hind legs.

The latitude observed here was 75° 06′ 58″, the longitude 110° 30′ 32″, and the variation of the magnetic needle 128° 30′ 14″ easterly. We had passed, during our last march, a good deal of rich soil, consisting principally of decayed moss and other vegetable substance mixed with sand; and the sorrel and saxifrage (*Saxifraga oppositifolia*) were more abundant than before.

A fog, which had prevailed during the early part of the day, having cleared

away in the afternoon, we struck the tents at five P.M., and having travelled three quarters of a mile, came to a ravine not less than a hundred feet deep, and in most parts nearly perpendicular. A place was at length found in which the cart could be got across, which we succeeded in effecting, through very deep snow, after an hour's labour. On the north side of this ravine large masses of sand-stone were lying on the surface of the ground, over which the cart could with difficulty be dragged; and we remarked on this, and several other occasions, that the stones which were bruised by the wheels emitted a strong smell, like that of fetid limestone when broken, though we could never discover any of that substance. In some of the sand-stone we found pieces of coal embedded; and some large pieces of a slaty kind of that mineral, which burned indifferently, were also picked up in the ravine. 1820. June.

We had hitherto, as we judged, rather ascended than otherwise since leaving the north-east-hill of Winter Harbour, and the height of this part of the island may be estimated at three or four hundred feet above the level of the sea. At two miles and a quarter to the northward of the ravine, we entered upon a snowy plain, of which we could not see the termination to the northward. Here and there only we came to a small patch of uncovered land, on one of which we observed the sand and sand-stone to be tinged of a light brick colour. We halted to dine before midnight, having made good, by our account, a distance of only five miles, and that with difficulty, the snow being soft, which made travelling very laborious. We found here nothing but two small pools of dirty water, but, as it was of importance to save our wood in case of accidents, we went on an allowance of half a pint of this water each, rather than expend any of it in melting snow, a process requiring more fuel than perhaps those who have never made the experiment are aware of. There was no vegetation in this place, even the poppy having now forsaken us.

At two o'clock on the morning of the 4th we continued our journey to the northward, over the same snowy and level plain as before, than which it is impossible to conceive any thing more dreary and uninteresting. It frequently happened that, for an hour together, not a single spot of uncovered ground could be seen. The few patches of this kind forcibly reminded one of the description given of the *oases* in the deserts of Africa, not only because they relieved us for a time from the intense glare of the sun upon the snow, which was extremely oppressive to the eyes, but because it was on these alone that we could pitch our tents to rest, or that we could expect to meet with any water. The breeze freshened up to a gale from the S.S.E. as we proceeded, Sun. 4.

1820. June. and the men, as if determined not to forget that they were sailors, set a large blanket upon the cart as a sail, which, upon the present level ground, was found to be of material assistance. The snow was deep, and rather soft, which made the travelling heavy; and as the wind produced a good deal of snow-drift, most of the bare patches of ground became covered up, so that when our time for halting had arrived, not a piece of ground could be seen on which to pitch the tents. Captain Sabine and myself went forward to look out for a spot, and at length were fortunate to meet with one, on which there was just room for our little encampment. It was with some difficulty, by building a wall with stones and our knapsacks, that we prevented its being covered with snow before the party came up, which they did at half-past seven A.M., having travelled ten miles in a N.W.b.N. direction. We saw a few fox-tracks, but no animals, nor the smallest symptom of vegetation, during this march. It is not improbable, however, that these snowy plains, when uncovered by the warmth of summer, may present a more luxuriant vegetation than is elsewhere to be met with on this island.

By the time we had secured the tents the wind blew hard, with a continued fall as well as drift of snow, so that we could not but consider ourselves fortunate in having met with a spot of ground in good time. Notwithstanding the inclemency of the weather, we found the tents afford us very comfortable and sufficient shelter, the cart being tilted up to windward of them, so as to break in some measure the violence of the wind; and when wrapped up, or rather enclosed in our blanket-bags, we were generally quite warm enough to enjoy the most sound and refreshing repose. I may here notice, once for all, that the moment the tents were pitched, however short the time for which it was proposed to halt, every man was directed immediately to change his shoes and stockings, and at the same time had his feet examined by Mr. Fisher. As it froze hard every night, we used only to get our things dried during the noon halting, so that we were always under the necessity of putting on the same wet boots and stockings after resting at midnight. This was the only way to make certain of dry stockings for sleeping in, and as we were sure to be wet in half an hour after starting, our putting on wet ones to walk in was of little consequence. I insist the more on this circumstance, because it is to our attention to these precautions that I attribute the good health we enjoyed during the journey. To this, indeed, we had one exception, Captain Sabine having suffered some uneasiness from indigestion, in consequence of having eaten some of the salep-powder badly mixed; but by attention to his diet,

together with a little medicine, the complaint was soon removed. It is scarcely possible perhaps to imagine the comfort which was afforded in this instance by the small quantity of fuel we were provided with, as it enabled us to furnish Captain Sabine with one or two warm messes which chiefly contributed to his recovery; and we, therefore, determined to use no more of our wood except under similar circumstances. 1820. June.

It continued to blow and snow till seven P.M., when the wind having veered to the S.W., and become more moderate, we struck the tents; and having now placed the men's knapsacks on the cart to enable them to drag with greater facility, we proceeded on our journey to the northward. We passed a narrow but deep ravine lying across our course, in some parts of which the snow reached nearly to a level with the banks, forming a kind of bridges or causeways, on one of which we crossed without difficulty. The men had hoisted one sail upon the cart at first setting off; but the wind being now, as they expressed it "on the larboard quarter," a second blanket was rigged as a main-sail, to their great amusement as well as relief.

After crossing a second ravine, on the north side of which the ground rose considerably, we entered upon another snowy plain, where there was nothing to be seen in any direction but snow and sky. To make it the more dreary, a thick fog came on as the night advanced, and as this prevented our taking any mark more than fifty or a hundred yards a-head, we had to place the compass, by which we were now entirely travelling, upon the ground every five minutes; and as it traversed with great sluggishness, we made a very crooked and uncertain course. For more than two hours we did not pass a single spot of uncovered ground, nor even a stone projecting above the snow.

The weather being at length too foggy to proceed, we sat down on our knapsacks for a short time, and then continued our journey, the fog being somewhat less thick. At one A.M., we came to a few large stones sticking up above the snow, and as the people were a good deal fatigued, and I was at the same time desirous not to run the risk which might be incurred by suffering them to lie upon the snow, we determined to try what could be done in picking out the stones, one by one, and paving a spot for the tents over it. This plan succeeded, and after an hour's work we completed a dry, though hard flooring for our encampment. This being properly our dinner-time for the 4th of June, though our meal had been unavoidably delayed beyond that day, we did not forget to drink His Majesty's health in both Mon. 5.

1820. June. tents, not aware at the time that our venerable Monarch had many months before paid the debt of nature.

The fog continued too thick to allow us to move till six A.M., at which time we resumed our journey. There was a broad and distinct haze-bow of very white and dazzling light directly opposite the sun. The weather being still too foggy to see more than a quarter of a mile a-head, it was with considerable difficulty that we could proceed on a tolerably straight course. To effect this, it was necessary to determine the point on which we were walking by the bearing of the sun, which was still visible, and the apparent time, and then to take a mark a-head by which our course was to be directed. From the thickness of the weather, however, it was necessary to repeat this operation every five or ten minutes, which, together with the uniform whiteness and intense glare of the snow, became so extremely painful to the eyes, that Mr. Fisher and myself, who went a-head as guides, soon became affected with snow-blindness, and the headmost man at the cart, whose business it was constantly to watch our motions, began to suffer in a similar manner, and from the same cause. We had now also frequent occasion to experience—what had so often occurred to us during the winter,—the deception occasioned in judging of the magnitudes, and consequently the distances of objects, by seeing them over an unvaried surface of snow; this deception was now so much increased by the thickness of the fog, that it frequently happened that, just as we had congratulated ourselves on having pitched upon a mark at a sufficient distance to relieve us from the necessity of straining our eyes for a quarter of an hour, we suddenly came up to it; and were obliged to search, and often in vain, for another mark, at no great distance, and subject to the same delusion.

It may, perhaps, be conceived, then, under these circumstances, how pleasing was the relief afforded by our seeing, at eight A.M., a stripe of black or uncovered land a-head, which proved to be the bank of a ravine fifty or sixty feet deep, and three hundred yards wide, on the north side of which we pitched the tents, having made good only one mile and a half, the snow being so soft and deep as to make it difficult to drag the cart through it. This ravine was full of innumerable masses of sand-stone, besides which we could not find a single mineral substance of any other kind. By removing any of these, we found abundance of pure water, which tempted us to take this opportunity of cooking the grouse we had killed, on which we made a most sumptuous meal before we retired to rest.

The latitude observed here was 75° 22′ 43″, and the longitude, by the chronometer, 111° 14′ 26″, in which situation a cylinder of tin, containing an account of our visit, was deposited under a pile of stones eight feet high, and seven feet broad at the base. At half-past five P.M., we continued our march in a north-easterly direction, the wind being moderate from the S.S.E., with fine weather. Another of our party complained of snow-blindness, which always continued to be very painful during the time we were walking, but was generally relieved by the usual cool bathing and a few hours' rest. Our people were all supplied with crape veils, which, I believe, saved us a good deal of uneasiness from this complaint. 1820. June.

On leaving the ravine, where we had last halted, we had entered on another snowy plain similar to those I have before described; and, after travelling several miles over it without a single object to produce variety, or to excite interest, came at length to a rising ground at half-past eleven, from which we descried some dark-coloured ground to the north-eastward, and shortly after some higher land at a considerable distance beyond it, in the same direction. The intermediate space looked like a sea covered with ice, or a very level snowy plain, and we were once more puzzled to know which of these two it would prove. Having reached a good dry spot for the tents, with plenty of water in the neighbourhood, we halted at midnight, having marched seven miles and a half in a N. b. E. direction by account, but much more easterly by subsequent observations. I cannot help remarking in this place how extremely liable to error any account must necessarily be of the course and distance made good during even a single day on a journey of this nature. We had long been in the habit of deducing all our bearings and courses on board the ships astronomically, that is, by the azimuth of the sun and the apparent time; and when I set out on this journey I had conceived that this habit would have enabled me to make tolerably certain at least of the direction in which our daily journey had been performed, whenever the sun should be visible. That this was by no means the case, though every possible attention was paid to it, will appear clear from an inspection of our track upon the map, which is laid down by the actual observations of two separate persons from day to day, and in which no material error could have occurred. My reason for dwelling upon this circumstance is to point out the extreme liability to error in laying down by account the position of any point at which a traveller may arrive after a journey of several hundred miles. This remark I cannot but consider to be peculiarly applicable to the journey of

1820. June. Hearne from the Hudson's Bay settlements to the shores of the Polar Sea, on the northern coast of America, in many hundred miles of which, and particularly in the most interesting part, not a single observation for latitude and longitude, or the variation of the magnetic needle, was obtained, whereby his daily estimate could be corrected. Should, therefore, the geographical position assigned by Hearne to the Copper-mine River be found at all near the truth, more especially in longitude, it will prove an extraordinary instance of the tendency of errors to correct each other; such as, I believe, does not often occur, when the distance gone over is so considerable, either by sea or land.

Tues. 6. The wind increased to a fresh breeze from the S.S.E. with a sharp frost, making it very cold in the tents, which we therefore struck at four A.M., and at the distance of half a mile came to the summit of a hill overlooking what appeared to be a frozen sea before us. The distant high land beyond it to the north-east, now appeared a separate island, which it afterwards proved to be, and which I named after my friend and fellow-traveller, Captain Edward Sabine, of the Royal Artillery. The brow of this hill, which, from the best estimate I could form, appeared to be from four to five hundred feet above the level of the sea, was covered with large masses of sandstone, over which we could scarcely get the wheels of the cart. We then descended the hill, with the intention of pushing forward to determine whether the white and level space before us was the sea or not. We had not proceeded far, however, when the clouds began to gather heavily in the south-east, and shortly after snow and sleet began to fall. Being unwilling, therefore, to allow the men's clothes to be wet, when there was no absolute occasion for it, we halted on a piece of dry ground, and, having built a wall six feet high to shelter us from the weather, pitched the tents very comfortably under the lee of it, till the weather should allow us to proceed.

We here saw one or two flocks of geese, which, to judge from those which we afterwards killed, were probably brent-geese *(Anas Bernicla)*, and were the first living animals we had met with for two or three days. We had occasionally, during that time, seen upon the snow the tracks of a solitary deer, but even these seemed now to have deserted a place so totally devoid of vegetation, that for miles together we scarcely met with a tuft of moss or a single poppy on which they could have fed. The tracks of foxes and mice were also occasionally seen, but we did not meet with any of these animals in this dreary and uninteresting part of our journey.

At six P.M., the wind having gradually got round to the N.N.E., and the weather being more clear and cold, I set out, accompanied by Messrs. Nias and Reid, and a quarter-master of the Griper, with the intention of examining the situation and appearance of the sea to the northward; leaving the rest of the party, several of whom were suffering from snow-blindness, though otherwise in good health, to remain quietly in the tents till our return. Having travelled N.N.W. a mile and a half through much deep snow, of which a good deal had fallen during the day, we came to some ice thrown up on the beach, having cracks in it parallel to the line of the shore, which we immediately recognised to be of the same kind as those to which we had so long been accustomed in Winter Harbour, and which are occasioned by the rise and fall of the tide. Such, however, was the sameness in the appearance of the sea and of the low shelving shore interposed for two or three miles between it and the hill we had descended in the morning, that, had it not been for the circumstance I have just mentioned, we should still have been in great doubt respecting the nature of the level space to the northward. The place where we came to the sea happened to be near the outlet of a ravine, and the upper surface of the ice was here covered with pools of fresh water, which had probably been formed by the streams from the ravine, and which at a little distance appeared, as usual, of a beautiful blue colour. We turned to the westward along the beach, and at the distance of two miles ascended a point of land in that direction, from whence we had a commanding view of the objects around us. As soon as we had gained the summit of this point, which is about eighty feet above the sea, and was named after Mr. Nias, we had an additional confirmation that it was the sea which we had now reached, the ice being thrown up on the beach under the point, and as far as we could see to the westward, in large high irregular masses, exactly similar to those which had so often afforded us anchorage and shelter upon the southern shores of the island. Being desirous, however, of leaving nothing uncertain respecting it, we walked out a few hundred yards upon the ice, and began with a boarding-pike and our knives, which were all the tools we had, to dig a hole in it, in order to taste the water beneath. After nearly two hours' labour, however, we could only get down as many feet, the ice being very hard, brittle, and transparent; more so, as we imagined, than salt-water ice usually is, which made us the more desirous to get through it. I, therefore, determined to return to our people, and to remove our encampment to Point Nias, for the purpose of completing the hole through the ice

1820. June.

1820. June. with all our hands, while we were obtaining the necessary observations on shore.

Wed. 7. On our return to the tents, we dined, and rested till one o'clock on the morning of the 7th, when we set out for the Point, at which we did not arrive till half-past four, the snow being here so deep as to make the cart an improper, and, indeed, almost impracticable, mode of conveying our baggage. It froze all day in the shade, with a fresh breeze from the north, and though the tents were pitched under the lea of the grounded ice upon the beach, we found it extremely cold; all the pools of water were frozen hard during the night, and some of our canteens burst from the same cause. The people were allowed to rest after their supper till four P.M., and were then set to work upon the ice, and in building a monument on the top of the Point.

The latitude observed here was 75° 34′ 47″, the longitude 110° 35′ 52″, and the variation of the magnetic needle 135° 03′ 55″ Easterly. A series of angles and astronomical bearings was here obtained for the survey of the coast, and for determining the position of Sabine Island, the north-western point of which, being bluff headland, was, by Captain Sabine's desire, named after Colonel Mudge, of the Royal Artillery, one of the Commissioners of Longitude. The land to the westward of Point Nias, sweeps round into a large bay, terminating to the north-westward, in a bold Cape bearing N. 43° W., and distant from six to eight leagues, which I named after Mr. Fisher. The easternmost part of Melville Island, here visible, was a low projecting point bearing S. 77° E., and distant eight or nine miles, which was called Point Reid, after the gentleman of that name, who accompanied us.

A continuous line of very large hummocks of ice extended from Point Nias, about two miles and a half in a N.N.E. direction; they were the kind of hummocks which always indicate the ice having met with resistance by grounding; and I have little doubt that a reef is clearly marked out by them. What makes this more probable is, that in the whole space between Points Nias and Reid, the ice near the shore seemed never to have been disturbed by any pressure upon it, being, perhaps, defended by the reef from the floes coming in from the north-west; while the whole of the shore, as far as I could see with a glass, to the westward of Point Nias, bore evident marks of that tremendous pressure, which is produced by fields of ice when set in motion.

The floe of ice proved to be fourteen feet four inches in thickness, and it

was ten at night before our people got through it, so as to admit the water; it then flowed up within fifteen inches of the upper surface of the ice, by with some idea may be formed of the specific gravity of the latter. The water was not very salt, owing probably to its acquiring a degree of freshness, in forcing itself through an aperture so small as to require three quarters of an hour to fill up the hole to its proper level; a small quantity of it, however, was sufficient to convince each of us, that it was the sea upon which we were standing, and a canteen was filled, in order to try its specific gravity on our return to the ships. The thickness of the ice on this coast, as compared with that in Winter Harbour, the former being double that of the other, may at first sight appear to be an indication of a more severe climate on this than on the southern coast of Melville Island; but this circumstance is easily accounted for by observing, that the ice of a harbour is, as we know by experience, the formation of a single winter; whereas, on an open and exposed beach, like that of Point Nias, the last year's, or sea-ice, is at liberty to fix itself in the autumn, forcing up the masses which we see aground in all such situations, and increasing, in the course of the ensuing winter, to the thickness which we here found it to be. Had we accidentally come to any bay or harbour, secure from the access of the floes from without, and of the same depth as Winter Harbour, I doubt not we should have found the ice in it of nearly the same thickness. 1820. June.

We saw nothing living in this spot, except a flock of five or six ducks, none of which were killed. There was scarcely any thing, except a little stunted moss and some lichens, which deserved the name of vegetation; and the only exception to the tiresome monotony of sandstone which had occurred for many days past, consisted in two or three pieces of red granite, and of red and white feldspar, which several hours' search enabled us to find. Two pieces of drift-wood were also found upon the beach, from ten to twenty feet above the present level of the sea; they were both pine, one of them being seven feet and a half long, and three inches in diameter, and the other much smaller. They were both partly buried in the sand, and the fibres were so much decayed and separated, as to fall to pieces upon being taken hold of.

We dined at midnight; and at half past one A.M., on the 8th, struck the tents, and drew the cart to the higher part of the Point, where we occupied two hours in completing our monument, which is of a conical form, twelve feet broad at the base, and as many in height. Within it were deposited Thurs. 8.

1820. June. a tin cylinder, containing an account of the party who had left it, and one or two silver and copper English coins. This monument may be seen at several miles' distance from the sea or land side; and, as great pains were taken by Mr. Fisher in constructing it, it may probably last for a long period of years.

Having now satisfactorily determined the extent of Melville Island to the northward upon this meridian, which corresponds very nearly with that of Winter Harbour, and finished all the requisite observations, I proposed pursuing our journey towards the Blue Hills, which were still in sight at the distance of several leagues to the westward; and having advanced to the south-west as long as circumstances should appear to make it interesting or practicable, to return by a circuitous route to the ships. We travelled in a W. $\frac{1}{2}$ S. direction, in order to keep on a ridge along the coast, which afforded the only tolerable walking, the snow being very deep on the lower parts of the land. We had to-day frequent occasion again to notice a strong smell produced by the wheels of the cart going over the blocks of sandstone, similar to that of fetid lime-stone when recently fractured. We halted at half-past seven A.M. on a fine sandy ground, which gave us the softest, as well as the driest, bed which we had yet experienced on our journey, and which was situated close to a little hillock of earth and moss, so full of the burrows of hares as to resemble a warren. We tried to smoke them out by burning port-fire, but none appeared; and it is remarkable that, though we constantly met with the dung of these animals, especially in this place, where it occurred very abundantly, we never saw one of them during the journey. As as soon we had halted, we found that Mr. Reid's knapsack had dropped off the cart; he had, therefore, to go back to look for it, and did not return till eleven o'clock, being so much affected by snow-blindness as to be scarcely able to see his way to the tents. This circumstance was sufficient to shew the advantage, and even the necessity of travelling entirely by night under these circumstances, the intense glare of light from the snow during the day inevitably producing this painful irritation in the eyes. Our present station, which was about half-a-mile distant from the sea, commanding an open view of Sabine Island and Cape Fisher, and the weather being very clear for observations, a short base was obtained for the survey, between this and Point Nias. The only birds we saw here were a pair of ptarmigans, which were killed by Mr. Fisher. There was some moss, and a few short tufts of grass; and we found, for the first time this season, the *Saxifraga Oppositifolia* coming out in flower, a

remark which I afterwards found to occur in the Hecla's Meteorological Journal at Winter Harbour on the following day. 1820. June.

At a quarter past five P.M. we resumed our journey to the south-west, and soon after crossed a snowy plain a mile and a quarter in breadth, extending to the sea to the north, and as far as the eye could reach to the south. When we had travelled five miles, we began to ascend considerably, and were now entering upon the Blue Hills, the higher parts of which, however, were three or four leagues distant to the westward of us. Having travelled S.W. b. W. seven miles, we halted, at half-an-hour before midnight, at the distance of three or four miles from the sea, the weather being very clear and fine, with a moderate breeze from the S.S.W. During the last march we passed over much uneven ground, of which a great deal was extremely wet; moss, saxifrage, and short tufts of grass here became more abundant, and, interspersed among the former, some sorrel began to make its appearance. One or two pieces of red granite, and some of feldspar, were all that occurred in this way to repay the tedious search which we had for many days been making to discover any thing but sand-stone.

Having rested, after our dinner, till half-past two A.M., we set out again to the south-west, making, however, a very crooked course on account of the irregularity of the ground. Although this circumstance made the travelling somewhat more laborious, we were glad to be among the hills, being heartily tired of the sameness which the snowy plains and low grounds present. In the first quarter of a mile, we passed the first running stream which we had seen this season, and this was but a small one, from six to twelve inches deep. The ground as well as the pools of water was frozen hard during the last night, but thawed during the day, which made travelling worse and worse as the sun acquired power. We passed a few deers' horns, killed three ptarmigans, and saw a pair of ducks. The plumage of the cock-grouse was still quite white, except near the tip of the tail, where the feathers were of a fine glossy black; but in every hen which we had lately killed, a very perceptible alteration was apparent, even from day to day, and their plumage had now nearly assumed that speckled colour which, from its resemblance to that of the ground, is so admirably adapted to preserve them from being seen at the season of their incubation. We found it difficult in general to get near the hens, which were very wild; but the male birds were at all times stupidly tame. Serjeant Martin, who was well acquainted with birds, reported having seen a pair of bank-swallows *(Hirundo Riparia.)* We halted at seven A.M., Frid. 9.

1820. June. having made only three or four miles, and found abundance of water, which allowed us the comfort of washing our flannel shirts and putting on clean ones. From this time, indeed, we had rather more water than we wanted, the abundance of it making a great deal of swampy ground, through which the cart was dragged with great difficulty. The latitude observed at this station was 75° 26′ 43″, the longitude by chronometer being 111° 22′ 41″.

We pursued our journey at half-past five P.M., and found the ground extremely wet and swampy, which made the walking very laborious; but we remarked that our feet always came to the frozen ground at the depth of eight or ten inches, even in those parts which were the most soft. At the distance of two miles and a half, we came to a ravine of which the principal branch, being not less than a quarter of a mile wide, took a N.N.E. and S.S.W. direction, and had a considerable stream of water running to the northward. Another branch from the S.E., which we crossed, was three hundred yards wide, and was as yet quite dry at the bottom. As the night came on, the weather became overcast, and a good deal of snow fell; from which, however, the people were sheltered by the sail which a fresh northerly wind once more enabled them to set on the cart. Two other ravines occurred within three quarters of a mile, apparently connected with the large one, and which it required our utmost exertion to cross, the water being higher than our knees in the middle, and the whole of the sides of the ravine covered with deep and soft snow, into which the wheels of the cart sunk nearly to the axle, so that we could only get it across by what sailors call a "standing pull." The men having got their trowsers wet, we continued our journey till half-past eleven, to give them a chance of drying, and then halted, having only travelled four miles in a S.W. direction. We met with abundance of sorrel in some parts of this journey; its leaves were as yet scarcely the size of a sixpence, and almost entirely red. A few ptarmigans and a couple of geese were all the living animals seen, but we passed several tracks and horns of deer.

Sat. 10. At half-past two A.M., on the 10th, we struck the tents, and proceeded to the S.W., the wind having got round to the S.E., with continued snow. At the distance of two miles we entered upon a level plain three miles wide, which, with the exception of a patch here and there, was entirely covered with snow. The uncovered parts of this plain were so wet as to be almost impassable for the cart; and we were now as desirous of keeping on the snow as, at the beginning of our journey from Winter Harbour, we had been anxious to avoid it. The plain terminated by a ravine, on the south bank of

which, finding good ground for the tents, and plenty of water, we halted at a quarter-past seven, being in latitude by observation 75° 20′ 54″, the longitude by account 111° 42′ 15″. 1820. June.

The weather continued hazy, with snow occasionally, but our clothes dried in the sun towards noon; soon after which, however, the snow became more thick and constant, so that we could scarcely see a hundred yards around the tents. We waited for some time in hope of the weather clearing, and then, at a quarter-past five, continued our journey; as we were under the necessity, however, of directing our course entirely by compass, which is here a very uncertain and deceitful guide, we made but a slow and tedious progress. The wind freshened up to a gale from the S.E. soon after we had set out, which made it impossible for us any longer to pursue our journey, and we began to look out for a spot on which the tents could be pitched, so as to afford us a dry flooring, if not shelter, during the gale. Having crossed three ravines within a mile and a quarter, we at length came to a very deep one, which was nearly perpendicular on each side, with the snow over-hanging in some parts, so as to make it dangerous to go near the edge of the bank. We were at length fortunate in finding a narrow sloping ridge of snow, leading down to the bottom of the ravine, and having descended this with some difficulty, we found such good shelter as to determine me to halt here for the night, which now became more and more inclement. The bottom of the ravine, in which there was not much water, abounded with schistose sandstone, with which a dry and comfortable flooring was soon paved for the tents, taking care to pitch them at a sufficient distance from the north bank of the ravine, under which a number of large masses of snow were lying, which had lately fallen from the over-hanging part of the cliff, not less than eighty or a hundred feet perpendicular in this place.

The weather continued very inclement during the night, but we were so well sheltered, as to be very comfortable in the tents, which answered every purpose for which they were intended, and without which no warmth could have been obtained while resting. I may also here remark, that the mode we had adopted with the blankets, of making them into bags, appeared the warmest, and in every respect the most comfortable as well as convenient which could have been devised. The wind gradually veered to the N.N.W. in the morning, and the weather having cleared up about half-past four we struck the tents, and set off to the southward. The south bank of the Sun. 11.

1820. June. ravine being nearly as steep, and much higher than the other, it was with considerable labour and difficulty that we were able to get the cart up it, in which, however, we succeeded by six o'clock, when we found that we were travelling on much higher ground than before, overlooking that which we had left the preceding evening. Having proceeded four miles over a level country, with much snow upon it, we suddenly and unexpectedly came in sight of the sea, or a lake, at the distance of two or three miles before us, just appearing between two high and steep hills which terminated a deep and broad ravine. In a short time, we opened out an island, which was soon recognised to be the same which we had seen to the eastward of us, on our journey to the north, and which we now found to be situated in this lake or gulf. We hastened forward to the point of the nearest hill, from whence the prospect was extremely grand and picturesque. We were looking down nearly perpendicular from a height of eight or nine hundred feet, on an extensive plain of ice, of which, to the westward, we could perceive no termination for a distance of five or six leagues, the prospect to the eastward being obstructed by other hills. A thick mist or vapour was at times carried rapidly along by the wind over this ice, to which it was entirely confined, occasionally covering the top of the island with a dense cloud. The impression made upon our minds at the time was, that it was a frozen lake on which we were now looking; but this conjecture, as it afterwards appeared, proved erroneous. The ravine at which we had arrived discharges its waters into a snug cove two or three miles deep, which was named after Mr. Bushnan, and at the head of which we now proposed resting, if a place could be found at which our descent into the ravine could be effected. The sides of the ravine, which were very steep, were covered with innumerable blocks of sandstone of every size and shape, over which alone any road could be found to the cove below. It was necessary, therefore, to make the attempt, but it was impossible for the best built carriage to travel long on such a road; and when we had half descended the bank, which led into the ravine on its north side, the axle-tree broke short in the middle. The baggage was therefore taken off, and carried down to the bottom, where the tents were pitched at eleven A.M., the wheels being left where the cart broke down, as sound as at first.

The latitude observed here was 75° 12′ 50″, the longitude, by chronometer, 111° 50′ 05″, and the variation of the magnetic needle 125° 12′ 22″ Easterly. The wind being fresh from the W.N.W., and the weather being

cold and raw, we built a wall to windward of the tents, as a substitute for the usual shelter afforded by the cart; after supper, the people being a good deal fatigued, were allowed to rest till near midnight, and then employed in arranging the baggage, so as to carry it on our shoulders for the rest of the journey. We saw here a great number of brent-geese, some ptarmigan, and many snow-buntings; the constant and cheerful note of the latter reminded us of a better country. The wood which composed the light frame-work of the cart being now disposable as fuel, we were glad to make use of it in cooking a few ptarmigan, which afforded us another sumptuous meal. It is not, perhaps, easy for those who have never experienced it, to imagine how great a luxury any thing warm in this way becomes, after living entirely upon cold provisions for some time in this rigid climate. This change was occasionally the more pleasant to us, from the circumstance of the preserved meats, on which we principally lived, being generally at this time hard frozen, when taken out of the canisters. 1820. June.

Having finished our arrangements with respect to the baggage, which made it necessary that each of the men should carry between sixty and seventy pounds, and the officers from forty to fifty; we struck the tents at half-past two on the morning of the 12th, and proceeded along the eastern shore of the Cove, towards a point which forms the entrance on that side. The rocks above us, which here approach the sea within fifty yards, were composed of sandstone in horizontal strata; and, in many parts of the cliffs which overlook the Cove, their appearance resembled more the ruins of buildings than the work of nature. Large fragments of stones which had fallen from above, were strewed about at the base of these precipices, filling up nearly the whole space between them and the beach. The head of Bushnan Cove is one of the pleasantest and most habitable spots we had yet seen in the Arctic Regions, the vegetation being more abundant and forward than in any other place, and the situation sheltered and favourable for game. We found here a good deal of moss, grass, dwarf-willow, and saxifrage, and Captain Sabine met with a ranunculus in full flower. Mon. 12.

We arrived at the Point at five o'clock, and as we could now perceive that the lake or gulf extended a considerable distance to the eastward, as well as to the westward, and that it would require a long time to go round in the former direction, I determined to cross it on the ice; and as the distance to the opposite shore seemed too great for one journey, the snow being soft upon the ice, first to visit the island, and having rested there, to proceed

1820. June. to the southward. Having walked five miles in a S.S.W. direction, we landed at seven A.M., near the south-east part of the island, which I named after my friend Mr. Hooper. We had now little doubt that we had been travelling over a gulf of the sea, as we had not seen any land enclosing it to the westward, for more than two points of the compass, the weather being very clear; but, as nothing could make this absolutely certain but tasting the salt-water, I had just signified my intention of occupying the rest of the day in digging a hole through the ice for this purpose, when one of the party having gone to a pool on the floe for some water to drink, found it to be quite salt, and thus saved us any further trouble or doubt respecting it. The wind was fresh from the westward, and the tents were pitched near the beach, under the lee of the high part of the island. Captain Sabine and myself, having ascended to the top, which is on the east side from five to six, and on the west, about seven hundred feet above the sea, and in many parts nearly perpendicular, we had a commanding view of this fine gulf, which I named after my much-esteemed friend and brother-officer, Lieutenant Liddon. The entrance of the gulf to the westward was now very apparent, the head-lands which appeared to terminate its north and south shores being distant from us from five to seven leagues. I named them after Lieutenants Beechey and Hoppner, and their astronomical bearings were S. 86° W., and S. 65° W. respectively.

The north shore of Liddon's Gulf, being the termination of the Blue Hills to the south-west, is high, bold and precipitous as far to the eastward as Bushnan Cove, and its formation appeared, with a glass, to be the same as in that neighbourhood; beyond this, to the eastward, the land becomes low, and the gulf takes a bend to the north-east. In this direction we could not distinguish its extent, but we must have passed at no great distance from the head of it on the 4th. A bluff cape on this shore, which is seen very conspicuously on a clear day from the Table-hill of Winter Harbour, was named after Mr. Edwards, who had been the first among us to conjecture from its appearance, that water would be found at its foot. Immediately to the westward of Cape Edwards the land recedes, forming a bay, called Barry's Bay, of which our situation and distance did not allow us to see the extent. We found that the nearest land to us on the opposite shore was not on the south coast of the gulf, as we had supposed, but a point to the E.S.E., for which it was, therefore, proposed that we should next cross the ice: the south shore is all high and steep, but

much less so than the north; its nearest part was seven or eight miles distant. 1820. June.

Hooper's Island is principally composed of the same stratified sand-stone as the adjacent shores; on the top of the island, however, we also found a great deal of clay iron-stone, varying in colour from fine chocolate to dark blue, some of which was remarkably compact and heavy; and several lumps of calcareous spar, or crystallized carbonate of lime, were picked up on the beach. We met with little or no vegetation, a few stunted tufts of moss being, I believe, all that occurred in that way. There were a great many brent-geese on the beach, of which four were killed, weighing about four pounds each when shot, and two pounds when ready for dressing. We saw also several grouse, a great many snow-buntings, whose lively note still saluted us wherever we went, a raven, and an ivory gull. The latitude, observed at the tents, was 75° 05′ 18″, the longitude, by chronometer 111° 56′ 58″, and the variation of the magnetic needle 123° 47′ 58″ easterly.

We rested till six P.M., and then set off across the ice for the point. The snow had now become so soft after the heat of the day, that, loaded as we were, we often sunk nearly up to the knees, which made travelling very laborious, and we were, therefore, not sorry to get on shore by half-past eight, having walked, by our account, three miles and a half. On landing we saw two deer, but they were too shy to allow our sportsmen to come near them. We directed our course to the south-east, along a narrow ridge of land interposed between the sea and a lagoon, which now made its appearance at the back, and which is about three-quarters of a mile long in a north-east direction, and a quarter of a mile wide. It communicates with the gulf by a narrow opening, only forty or fifty yards across, which, as well as the lagoon, was still completely frozen over. In this neighbourhood we picked up the root and three feet of the trunk of a small pine-tree, about fifteen feet above the present level of the sea. We passed also a part of the skeleton of a musk-ox, frozen hard into the ground. The soil here became very rich, and abounded with the finest moss, together with a great deal of grass, saxifrage and poppy; and the quantity of dung which covered the ground shewed it to be a feeding-place for the deer, musk-oxen, and hares: the tracts of the former were numerous and recent. We halted at half-past eleven, Hooper's Island being distant from us five miles and a half in a W. b. N. direction. The night was remarkably clear and fine, with a light wind from the westward.

The spot on which we encamped appeared so favourable for obtaining

1820. June. specimens of the different animals which frequent this island, that I determined to remain here one day for the purpose of sporting and examining its natural productions. The latitude observed at the tent was 75° 02′ 37″, the longitude, by the chronometer, 111° 37′ 10″, and the variation 126° 01′ 48″ easterly; from this station astronomical bearings were obtained for the survey of the gulf.

Tues. 13. The sportsmen went out early in the morning, and soon after met with a musk-ox feeding on a spot of luxuriant pasture-ground, covered with the dung of these animals, as well as of deer. They fired at him from a considerable distance, without wounding him, and he set off at a very quick pace over the hills. The musk-ox has the appearance of a very ill-proportioned little animal, its hair being so long as to make its feet appear only two or three inches in length; they seem, indeed, to be treading upon it at every step, and the individual in question actually did so in some instances, as the hair was found in several of the foot-tracts. When disturbed and hunted, they frequently tore up the ground with their horns, and turned round occasionally to look at their pursuers, but they never attempted to attack any of them. Our gentlemen also met with a herd of twelve deer, three only of which had horns, and they were much the largest of the herd, and constantly drove the others away when they attempted to stop. The birds seen by our people were many brent-geese and ptarmigans, several golden plovers, one or two "boatswains" (*Lestris Parasiticus*), and abundance of snow-buntings. One or two mice (*Mus Hudsonius*) were caught; like several others we had seen, these were turning brown about the belly and head, and the back was of a dark grey colour. In every part of the island over which we travelled, the holes and tracts of these little animals were occasionally seen; one of them which Serjeant Martin ran after, finding no hole near, and that he could not escape, set himself against a stone, as if endeavouring to defend himself, and bit the serjeant's finger when he took hold of him.

On a point of land at the distance of three-quarters of a mile to the W.b.S. of the tents, and within a hundred yards of the sea, the remains of six Esquimaux huts were discovered; they consisted of rude circles, about six feet in diameter, constructed irregularly of stones of all sizes and shapes, and raised to the height of two feet from the ground; they were paved with large slabs of white schistose sandstone, which is here abundant; the moss had spread over this floor, and appeared to be the growth of three or four years. In each of the huts, on one side, was a small separate com-

partment forming a recess, projecting outwards, which had probably been their store-room; and at a few feet distant from one of the huts was a smaller circle of stones, which had composed the fire-place, the mark of fire being still perceptible upon them. The huts which we had seen upon Byam Martin Island, as well as those which we had visited on the coast of Greenland in 1818, had each one of these small circles attached to them; there was also a separate pile of stones at a little distance from the huts, on which the ptarmigan had lately taken up their abode, and which was probably another fire-place. If the Esquimaux derive any part of their subsistence from the land, and are under the necessity of coming to this high latitude in quest of it, they will, perhaps, no where find better fare for a month or six weeks than in this neighbourhood, for I have no doubt that, in the months of July and August, the game is here in great plenty. It is scarcely possible, however, upon the whole, that these people could long subsist on any part of Melville Island, the summer season being much too short to allow them to lay in a sufficient stock of provisions for a long and severe winter. It was remarked by Captain Sabine and Mr. Fisher, who had both landed on Byam Martin Island, that the huts we had now discovered appeared to be more recently deserted than the others. 1820. June.

The day was fine and clear, with a moderate wind from the westward till four P.M., when it died away, and was shortly after succeeded by a breeze from the southward, with a fall of snow. When we were setting off to the southward, a herd of five deer came towards the tents, but we did not succeed in killing any of them. We now travelled due south with the intention of getting sight of the Table-hills, and returning by that route to the ships, as there appeared to be nothing more within our reach of sufficient interest to detain us any longer from them. At eight P.M., finding that the people's clothes were becoming wet through by the sleet which fell, we halted and pitched the tents, the wind having freshened up to a strong breeze from S.E.b.S., and the night being very inclement. There was here a great deal of clay mixed with the soil, and the sandstone began to be almost entirely of a greenish colour.

Early in the morning of the 14th, the wind veered to the westward, and the weather became gradually more clear; we therefore continued our journey to the southward, and having passed over several ridges of high ground lying across our track, and crossed some ravines lying in a N.E. and S.W. direction, we came in sight of the Table-hills bearing S.E. of us, and Wed. 14.

1820. June. at eight A.M, pitched the tents on some dry ground on the bank of a ravine. Two of the men complained of disordered bowels during the last march, occasioned, as they supposed, by having taken too copious a draught of very cold water at setting out in the morning. They were quite relieved, however, by a few hours' rest, and our snow-blindness had now completely left us. The snow-buntings, the only birds seen, were here very numerous, and were flying about our tents all day like sparrows. We moved on towards the Table-hills at five P.M., and crossed several ravines without much water in them, running generally to the north-eastward, and which therefore, probably, empty themselves into Liddon's Gulf. As the Table-hills are almost entirely composed of the *debris* of limestone, while we had hitherto met with nothing but sandstone, we were anxious to observe when the former would be found to commence, but we met with none of it till within a few hundred yards of the hills, when it began to occur in small pieces lying on the surface, with a little granite and feldspar, the soil being still quite sandy. We halted between the Table-hills at ten o'clock, having travelled eight miles over very swampy ground, and with the snow up to our knees in some of the hollows. We met with no living animals during this part of the journey, and it may be remarked, generally, that we always found the game of every kind more abundant near the sea than inland. except on the north coast of Melville Island, which is too barren to afford them subsistence.

Thur. 15. As I was desirous of remaining here till after noon, to obtain observations for determining the situation of the Table-hills, the easternmost of which is the most conspicuous object on this part of the coast, as well as a mark for the anchorage in the Bay of the Hecla and Griper, the people were employed early in the morning in carrying stones to the top of it, where a monument ten feet high, and the same in breadth at its base, was erected by Mr. Fisher and a copper cylinder, containing a full account of our visit, deposited within it. In the meantime, Captain Sabine and myself were occupied in obtaining the necessary observations, by which the latitude of the hill was found to be 74° 48′ 33″, its longitude 111° 11′ 49″, and the variation of the magnetic needle 123° 05° 30″ Easterly. Having before given some account of the minerals found in this neighbourhood, I shall only add on this subject, that, among the mineralogical specimens now added to our collection, was a piece of fossil wood, found at the foot of the westernmost of the two hills, lying loosely and separately upon the sand. It may be imagined, that

we looked anxiously towards the sea for any appearance of open water in the offing, but nothing of this kind was visible, though the prospect was a commanding one, as far to the westward as a S.S.W. bearing. 1820. June.

As soon as the observations were completed, we set off for Winter Harbour, and having passed over much rich and wet ground, abounding with sorrel, which now began to put forth its leaves with more vigour, arrived on board at seven P.M., having been met, and welcomed most heartily, by almost every officer and man belonging to the ships; and it was no small satisfaction to me to hear it remarked, that the whole of our travelling party appeared in more robust health than when we left them.

ASIATIC SOCIETY MUMBAI

CHAPTER IX.

OCCURRENCES AT WINTER HARBOUR IN THE EARLY PART OF JUNE—GRADUAL DISSOLUTION OF THE ICE UPON THE SEA, AND OF THE SNOW UPON THE LAND—HUNTING PARTIES SENT OUT TO PROCURE GAME—DECEASE AND BURIAL OF WILLIAM SCOTT—EQUIPMENT OF THE SHIPS COMPLETED—TEMPERATE WEATHER DURING THE MONTH OF JULY—BREAKING UP OF THE ICE NEAR THE SHIPS—MOVE TO THE LOWER PART OF THE HARBOUR—SEPARATION OF THE ICE AT THE ENTRANCE—PREPARE TO SAIL—ABSTRACT OF OBSERVATIONS MADE IN WINTER HARBOUR.

1820. June. I HAD the happiness to find, on my return, that the officers and men in both ships continued to enjoy the same good health as before, with the exception of Scott, who was still the only man in the Hecla's sick-list, and whose complaint seemed such as to baffle every attempt that had been made to produce an amendment. A constant disposition to fainting and a languid sort of despondency had been, for some time past, the only symptoms which induced Mr. Edwards to continue the anti-scorbutic treatment, and this it was sometimes absolutely necessary to discontinue for a day or two together, on account of the weak state of his bowels. During my absence he had been much worse than before, notwithstanding the greatest care and attention paid to him, but he was now once more better. He had lived almost entirely on the ptarmigan and ducks, of which a sufficient quantity had been procured to serve the sick and convalescent in both ships abundantly, and none had at this time been issued to any other officer or man in the expedition.

The equipment of the ships had gone on satisfactorily during my absence, the Griper being nearly ready for sea, the Hecla not quite so forward, on account of the heavy work with the ballast, of which sixty-five tons had been brought on board to supply the deficiency of weight in her holds. The survey of the provisions, fuel, and other stores was completed, and the

quantity and condition of them, with the exception of the lemon-juice and vinegar before mentioned, were found to be satisfactory. Indeed, the whole of the provision was ascertained to be as good as when it came out of store, more than twelve months before, except a small quantity of bread and of sugar on the outside part of a few casks, on which a little moisture appeared, and which made it expedient to use those articles first. This excellent state of our provisions must, independently of the antiseptic properties of a cold climate, which is unfavourable to the process of putrefaction or the accumulation of vermin, be mainly attributed to the care which had been taken to supply us with every article of the best quality, and to pack the whole in strong, tight casks, which were at once impervious to water, and less liable to damage by accidents in the hold. With respect to vermin, I may here mention, that not a mouse, or rat, or maggot of any kind, ever appeared on board, to my knowledge, during this voyage. 1820. June.

A very perceptible change had taken place in the ice of the harbour on its upper surface, it being covered with innumerable pools of water, chiefly brackish, except close in-shore, where the tides had lifted the ice considerably above the level of the sea.

Previously to the continuance of the narrative of occurrences subsequently to my return from the land-journey, it may be proper to give some account of the observations made on board the ships by Lieutenants Liddon and Beechey, during my absence from Winter Harbour.

From these it appears, that the first red phalarope, (*Phalaropus Platyrinchos*), and also the first flock of snow-buntings which had been observed at Winter Harbour this season, were seen on the 2d of June. It is perhaps worthy of remark that, from eight P.M. on the 1st, till midnight on the 2d, being an interval of twenty-eight hours, the mercury in the barometer remained steadily at thirty inches, without varying a single hundredth. The weather was cloudy, and the wind rather variable, though moderate from the northward and westward during that time, and two or three fine days succeeded it, though with some appearance occasionally of rain or snow. Frid. 2.

A flock of twelve king-ducks, flying to the north-east, together with a single raven and an arctic gull, made their appearance on the 3d, and a golden plover was also killed, and a few others seen on that day. The thermometer rose in the shade from 29° at 4 A.M., to 43° at noon, which is one of the greatest changes that was experienced in the course of one day at this part of the scale. Sat. 3.

1820. June. Sun. 4 On the 4th, Lieutenant Liddon caused His Majesty's birth-day to be commemorated in the best manner that the situation of the ships would permit, by hoisting the ensigns and pendants, and directing full allowance of provisions to be served to the crews. It is remarkable that, at Winter Harbour, the weather was fine, and the wind moderate from the S.S.W., during the 4th, while, at a few leagues' distance to the northward, we experienced a heavy gale from the southward, with continued snow and a Mon. 5. heavy drift. On the 5th, the officers remarked a more perceptible thaw than before, both on shore and on the ice, many pools of water having appeared in new places on the latter, and the snow disappearing fast from the land, though no streams of water were yet seen in the neighbourhood of Winter Harbour. Flocks of ducks and geese were from this time seen almost daily for the next six weeks, except immediately about the ships, from which the game of every kind was scared soon after their arrival from the southward.

Wed. 7. On the 7th, Lieutenant Liddon walked over the ice to the entrance of the harbour, where there was not even so much alteration perceptible as about the ships; indeed, every thing remained exactly the same, to all appearance, as in the middle of winter. At five P.M., the weather being hazy, and a light shower of snow falling, a strongly prismatic rainbow appeared, a phenomenon of rare occurrence in these regions; it had, I believe, nothing Frid. 9. about it different from those observed in other climates. On the 9th, the first seal was seen, lying upon the ice, near the mouth of the harbour, and having a hole close to him, as usual; as we never saw more than one of these animals here at a time, and that very rarely, it was common for us, whenever this did occur, to remark that *the* seal had been seen, and the same mode of expression was as naturally and more justly applied to the bear seen in the autumn soon after our arrival here. So few, indeed, are the animals in this neighbourhood, which either live in the sea, or derive their subsistence from it, that it is scarcely possible that the Esquimaux, who depend chiefly, if not entirely, upon them for provision, could long exist on the shores of Melville Island. About this time several mosquitoes (*Culex Pipiens*) were caught, but they were never of the least annoyance to us, as is the case on the shores of Hudson's Bay, and in other cold countries; nor indeed, did I hear of any of our people having once been bit by them. The buds of the *Saxifraga Oppositifolia*, and of the dwarf-willow, were observed to be opening out on the 9th, and some of the sorrel to be in flower; a plant with a flower of a lilac colour, having a very sweet smell,

and which we supposed to be a *Draba*, was also observed to be pushing out its blossoms about this time; but none of these plants were so forward as the saxifrage. 1820. June.

On the 11th, another instance occurred of a remarkable difference in the weather in Winter Harbour, and at no great distance to the northward of it, the weather being described in the Meteorological Journals of the ships, as very inclement, with a gale of wind from the westward, while, near Bushnan Cove, we enjoyed a clear and moderate day. Some hares were seen, for the first time, to the eastward of the ships.

Some of the officers returned on the 14th, after an excursion of two days to the eastward, bringing with them three brent-geese, six brace of ptarmigan, and a golden plover, and having seen several hares. Mr. Beverly describes the soil upon the hills to be composed of clay, and the large masses of sandstone which are found on the surface as much impregnated with iron. The first rein-deer were seen from the ships this day; and it was conjectured by the officers, from the situation in which they were observed, and from their setting off directly to the northward, that they had just landed upon the island. Wed. 14.

Being desirous of procuring as much game as possible during the remainder of the time we might be destined still to remain in our present inactive state, and finding that the short daily excursions which our sportsmen were enabled to make in the usual way, did not take them to a sufficient distance from the ships for this purpose, I directed a party of officers and men to be prepared from each ship, under Lieutenants Beechey and Hoppner, to remain a few days out, at the distance of ten or twelve miles to the eastward and westward of the harbour, and to send in their game whenever any should be procured. They accordingly left the ships this evening, carrying with them tents, blankets, fuel, and the same allowance of provisions as was issued on board. Lieutenant Hoppner, who commanded the party which went to the south-west, was directed carefully to watch the ice, that any appearance of its breaking up might immediately be made known to me. Captain Sabine and his men were indefatigably employed during the day in pitching a laboratory-tent, having a marquee within it, for the reception of the clocks, it being his wish, now that the weather was more favourable for the purpose, to occupy the whole of the time which might elapse previously to the sailing of the Expedition, in making a fresh series of observations for the pendulums. At half an hour before midnight, a triple rainbow appeared, the outer arch Frid. 16.

1820. June. being quite complete, and strongly tinged with the prismatic colours; the second nearly perfect; and the inner one being only perceptible near its eastern leg.

Sat. 17. A fog in the early part of the morning, being dispersed by the warmth of the sun, the weather became fine and pleasant. Having observed that the sorrel was now so far advanced in foliage as to be easily gathered in sufficient quantity for eating, I gave orders that two afternoons in each week should be occupied by all hands in collecting the leaves of this plant; each man being required to bring in, for the present, one ounce, to be served in lieu of the lemon-juice, pickles, and dried herbs which had been hitherto issued. The growth of the sorrel was from this time so quick, and the quantity of it so great on every part of the ground about the harbour, that we shortly after sent the men out every afternoon for an hour or two; in which time, besides the advantage of a healthy walk, they could without difficulty pick nearly a pound each, of this valuable antiscorbutic, of which they were all extremely fond. A part of the leaves thus daily collected was served to the messes, both of officers and men, and eaten in various ways, such as pickles, salad, in puddings, or boiled as greens; in all of which modes it was constantly and abundantly used till we sailed from Winter Harbour, and for three weeks after, whenever an opportunity offered of sending on shore to procure it. Of the good effects produced upon our health by the unlimited use of fresh vegetable substances, thus bountifully supplied by the hand of nature, even where least to be expected, little doubt can be entertained, as it is well known to be a never-failing specific for scorbutic affections, to which all persons deprived of it for a length of time are probably more or less pre-disposed. It is reasonable, therefore, to attribute in a great degree to the use of the sorrel, the efficient state of our crews at the time of our re-commencing our operations at sea. We found also a few roots of scurvy-grass (*Cochlearia Fenestrata*), but they were too rare and the leaves too small to be of any service to us.

Mr. Wakeham, with a party from the S.W., returned in the evening from a shooting excursion, having killed the first deer that we had procured this season, which gave us sixty pounds of meat. A second, sent in by Lieutenant Beechey on the 19th, weighed only fifty-two pounds, when cleaned, though not of a very small size; but these animals are extremely lean on their first arrival from the south, and appear to improve in this respect very rapidly by the good feeding they find upon this island.

By the 20th of June the land, in the immediate neighbourhood of the ships,

and especially in low and sheltered situations, was much covered with the handsome purple flower of the *Saxifraga Oppositifolia*, which was at this time in great perfection, and gave something like cheerfulness and animation to a scene hitherto indescribably dreary in its appearance. The poppy (*Papaver Nudicaule*) and some other plants, which will be described hereafter, and most of which appeared in flower during the month of July, afforded us a degree of enjoyment that made us for awhile forget the rigour of this severe climate. 1820. June.

The wind increased to a fresh gale from the north on the night of the 20th, and continued to do so during the following day; so that Captain Sabine had great difficulty in keeping his tents secure, and in spite of every exertion the canvass came in upon one of them, and put it out of its place. The ravines, which had no water in them a week before, were now discharging such deep and rapid torrents into the sea, as to render them quite impassable. The suddenness with which the changes take place during the short season, which may be called summer in this climate, must appear very striking when it is remembered that, for a part of the first week in June, we were under the necessity of thawing artificially the snow, which we made use of for water during the early part of our journey to the northward; that, during the second week, the ground was in most parts so wet and swampy that we could with difficulty travel; and that, had we not returned before the end of the third week, we should probably have been prevented doing so for some time, by the impossibility of crossing the ravines without great danger of being carried away by the torrents, an accident that happened to our hunting parties on one or two occasions, in endeavouring to return with their game to the ships. Lieutenant Hoppner sent in another deer, being the largest of a herd of fifteen, notwithstanding which, it only furnished us with seventy-eight pounds of venison. Lieutenant Hoppner reported that the pools upon the upper surface of the ice to the south-west were rapidly increasing in size and number, but that no indication of its breaking up had yet appeared. Wed. 21.

On the 22d, at four P.M., a thermometer, in the shade on board the Hecla, stood at 51°, being the highest temperature we had yet registered this season. A swan was seen by Mr. Scallon on a pond to the S.W.; this was, I believe, the only bird of the kind seen during our stay here, except a dead one which was picked up on our first arrival.

On the 24th we had frequent showers of snow, which occur in this climate more or less at all times of the year; at this season, however, when the

1820. June. earth is warm, it seldom or never lies on the ground for a whole day together.

Sat. 24. Captain Sabine, among the numerous difficulties he had to overcome in completing his series of observations for the pendulum, was now annoyed by the constant thawing and sinking of the ground, though much pains had been taken to lay a solid foundation for the clocks to stand upon; fortunately, however, no serious inconvenience arose from this new annoyance. Lieutenant Beechey and his people procured another deer, and several hares and birds, which, added to the game already received, afforded a supply sufficient to substitute for three days' regular allowance, while near the ships scarcely a single bird could now be procured. Not doubting, therefore, of the advantage of this plan, I determined to continue it till near the time of our sailing, by relieving the parties after a certain number of days' absence. An account of the total quantity of game obtained during our long stay at Melville Island will be given hereafter. The men were, in general, particularly fond of these excursions, from which they invariably returned in the best possible health, though generally a little thinner than when they went out. As a matter of good policy, it was our custom to consider the heads and hearts of the deer as the lawful perquisites of those who killed them, which regulation served to increase their keenness in hunting, while it gave the people thus employed rather a larger share of fresh meat than those who remained on board.

Mon. 26. Lieutenant Beechey, on his return from the eastward at midnight on the 26th, reported that the ice along shore in that direction appeared in a more forward state of dissolution than near Winter Harbour, there being almost water enough in some places to allow a boat to pass, with several large cracks in the ice extending from the land some distance to seaward. The deer had now become much more wild near the tents, and it was therefore necessary to shift the ground a little. Lieutenant Beechey succeeded in killing one of these animals, by lying down quietly, and imitating the voice of a fawn, when the deer immediately came up to him within gun-shot. The horns of the deer, killed at this season, as Mr. Fisher remarks, were "covered with a soft skin, having a downy pile or hair upon it; the horns themselves were soft, and at the tips flexible and easily broken." The foxes, of which they saw several, "had a black spot, or patch, on each side of the hind-quarters, or hams." Lieutenant Beechey reported also, that one of the Hecla's quarter-masters, who belonged to his party, had met with the crown-bone of a whale

at the distance of a mile from the sea, and considerably above its present level. Another was subsequently found in a similar situation, more than a mile to the north of the harbour, and nearly buried in the earth, which was hard frozen around it. Two headlands, to the eastward of the ships, near the station which Lieutenant Beechey had chosen for the tents, and for the position of which he had obtained angles during his late excursion, were named after Messrs. Halse and Wakeham. 1820. June.

On the 29th, one of the men, in returning on board, from the daily occupation of gathering sorrel, found in a hole upon the ice a small fish, which appeared to be of the whiting species, and on going to examine the place where it was picked up, Mr. Edwards and myself found two others exactly similar. As there was as yet no communication between the sea and the upper surface of the ice, sufficiently large to admit these fish, it became a matter of question in what manner they had got into the situation in which we found them. It appeared most likely that they were frozen on the surface of the water at the beginning of winter when the frost first commenced, and perhaps, therefore, had been floating there dead. We remarked that whenever any hard substance is laid upon the ice in small quantities, it soon makes a deep hole for itself, by the heat it absorbs and radiates, by which the ice around it is melted. There were at this time upon the ice innumerable holes of this kind, some forming small, and others large pools of water; and in every one of these, without exception, some extraneous substance, such as sea-weed, sand, and not unfrequently a number of small putrid shrimps were found. In one of these holes the fish alluded to were found. It was curious to see how directly contrary was the effect produced upon the ice by a quantity of straw which was put out upon it in the early part of May, and which, by preventing the access of warmth, had now become raised above the general surface more than two feet; affording a strong practical example of the principle on which straw is made use of in ice-houses, and what was at that time of more importance to us, a proof how much the upper surface of the ice had been insensibly wasted by dissolution. Thur. 29.

Lieutenant Hoppner returned, on the evening of the 29th, from his hunting excursion to the south-west, bringing with him some game, and what was to us much more acceptable, the welcome information that the ice had been observed in motion in the offing on the 22d. This circumstance was first observed by Messrs. Skene and Fife, who were of Lieutenant Hoppner's party, and who were awakened by a loud grinding noise, which, as they

1820. June. had soon the satisfaction to find, was occasioned by the heavy field-ice setting rapidly to the eastward, at the distance of five miles from the land, and apparently at the rate of a mile an hour. The wind was at this time moderate, but on the preceding day it had blown a fresh northerly gale.

Lieutenant Hoppner likewise reported that he had, in the course of his late excursion, met with a lake between four and five miles in circumference, situated at the distance of twelve or fourteen miles to the westward of the entrance of Winter Harbour, and four miles from the sea. This lake was still frozen over, but, from the nature of the banks, had the appearance of being deep; and it is, probably, the same which Mr. Fife had fallen in with, at the time he lost his way in September 1819, and of the situation of which he had not been able to give any satisfactory account.

On the 27th of June, William Scott, of whose complaint I have before had occasion to speak, had become quite delirious, and could only be kept in bed by force. Mr. Edwards was at first in hopes that this was the effect of some temporary cause, but was afterwards of opinion that it resembled, in every respect, a state of absolute and permanent derangement; and this opinion was subsequently strengthened by some circumstances which only now came to our knowledge, and of which an account will be given in another place.

Frid. 30. For some days past Scott had been gradually growing worse, and on the evening of the 29th, he was so far exhausted, that Mr. Edwards did not expect him to survive through the night. At two A.M. on the 30th, I was informed by that gentleman, that Scott was dying, and before I could get my clothes on, he had breathed his last, without any apparent pain. As it was proper and desirable, in every respect, that his body should be opened, notwithstanding the prejudice which seamen entertain against this practice, and which it would, perhaps, be as well to overcome by more frequently insisting upon it, I willingly complied with Mr. Edwards's request to be allowed to perform the dissection. The result was satisfactory to the medical gentlemen in whose charge this unfortunate man had been placed; and, I may be permitted to add to myself also, inasmuch as it proved his death to have been immediately occasioned by a disease which, perhaps, no skill nor attention could have cured in any climate, or under any circumstances, and having no immediate connexion with our present peculiar situation, or with the nature of the service in which we were engaged. As this case has proved the only fatal one during a voyage, differing in many respects from any before undertaken, a more particular account of it may not, perhaps, be

considered uninteresting; with this view, therefore, as well as from an anxious desire to do justice to the skill and humane attention displayed by the medical officers during the whole course of this poor man's illness, I have requested Mr. Edwards to furnish me with a detailed statement of his case, and of the treatment adopted, which will be found in the Appendix. 1820. June.

For the last two or three days, the spring-tides, which had been unusually high, overflowed the ice near the beach, so as to make it difficult to land near high water. In the general appearance of the ice of the harbour, there was no very perceptible alteration from day to day, though the thawing process was certainly going on with great rapidity at this period. The officer who relieved Lieutenant Hoppner, in command of the hunting party to the south-west, received strict injunctions to watch the ice constantly, and to make an immediate report of any appearance of open water in any direction. For the last four or five days in June, we had experienced more of southerly winds than usual, the weather being generally cloudy, with a good deal of small rain, and now and then a little snow; the general temperature of the atmosphere, however, was pleasant and comfortable to our feelings, as well as favourable to the dissolution of the ice, for which we were so anxiously looking.

One of Mr. Nias's party arrived from the eastward on the morning of the 1st of July, with a good supply of hares, ducks, and ptarmigans; he had seen above fifty deer in three days, but they were too wild to allow the party to get near them, in a country without the smallest cover of any kind. Another fish was picked up to-day in a hole on the ice, of the same kind as those before found. July. Sat. 1.

On Sunday the 2d of July, after divine service had been performed, the body of the deceased was committed to the earth, on a level piece of ground about a hundred yards from the beach, with every solemnity which the occasion demanded, and the circumstances of our situation would permit. The ensigns and pendants were lowered half-mast during the procession, and the remains of our unfortunate shipmate were attended to the grave by every officer and man in both ships. To the performance of this last melancholy duty, under any circumstances sufficiently impressive, the peculiarity of the scene around us, and of the circumstances in which we were placed, could not fail to impart an additional feeling of awful solemnity, which it is more easy to imagine than to describe. A neat tomb-stone was afterwards placed at the head of the grave by Mr. Fisher, who carved upon it the name of the deceased with the other usual information. Sun. 2.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *June*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	+40	+31	+36.29	30.00	29.88	29.940	N b.E.	Light breezes and cloudy weather.
2	36	31	34.17	30.00	30.00	30.000	to N.W.	Ditto ditto.
3	43	29	35.50	29.98	29.74	29.862	N. by West to South.	Moderate and cloudy.
4	39	31.5	35.63	29.70	29.50	29.597	South	Ditto ditto.
5	40	30	34.87	29.58	29.52	29.555	S.b.W.	Moderate and fine.
6	37	28	32.17	29.68	29.60	29.642	S.E. by S. to N.W.	Moderate and hazy.
7	31	28	29.63	29.64	29.50	29.553	N.N.W.	Ditto ditto.
8	36	28	32.08	29.60	29.55	29.590	West.	Ditto ditto.
9	38	30	33.92	29.69	29.60	29.638	W.S.W. to North.	Light breezes with rain at times.
10	33	32	32.25	29.73	29.62	29.692	S.E. to E.	Light airs to strong breezes: continued snow.
11	36	33	33.92	29.84	29.76	29.792	West.	Fresh breezes and cloudy.
12	34	30	32.54	29.94	29.86	29.895	West.	Moderate and cloudy.
13	37	29.5	33.46	29.93	29.75	29.895	West.	Moderate with snow and rain.
14	37	32	34.75	29.73	29.65	29.700	S.S.W. to N.N.W.	Fresh breezes, with squalls and snow.
15	39	29	34.67	29.80	29.74	29.775	N.W.	Moderate and clear.
16	37	29	33.75	29.90	29.85	29.877	S.S.E.	Light breezes and fine.
17	43	30	34.58	30.00	29.90	29.945	S.E.	Ditto ditto.
18	43	31	37.33	30.13	30.00	30.062	S.E.	Light breezes and fine.
19	40	34	37.67	30.13	30.08	30.112	North	Fresh breezes and cloudy.
20	39	34	36.25	30.07	29.97	30.022	North	Ditto ditto.
21	42	35	38.17	29.96	29.93	29.947	North	Strong breezes—fine clear weather.
22	51	36	44.33	30.04	29.94	30.005	North.	Moderate and cloudy.
23	45.5	38	42.08	30.00	29.93	29.970	North	Moderate and fine.
24	41	33	37.00	29.94	29.79	29.842	N.N.W.	Moderate and cloudy: occasional snow.
25	41.5	34	37.42	29.80	29.76	29.790	North	Fresh breezes and cloudy weather.
26	47	33	40.50	29.90	29.81	29.852	N.N.E. to S.W.	Light breezes and cloudy—small rain.
27	43	36	39.33	29.96	29.87	29.907	S.S.W.	Ditto ditto
28	44	32	37.17	29.81	29.74	29.785	S.E.	Ditto ditto.
29	46	39	41.92	29.79	29.75	29.767	North by East to South.	Ditto ditto.
30	48	37	43.75	29.80	29.59	29.677	S.S.W.	Fresh breezes and cloudy.
	+51	+28	+36.24	30.13	29.50	29.823		

A herd of fourteen deer being seen near the ships, a party was despatched in pursuit of them, with our customary want of success, it being almost impossible to approach them in so open and exposed a country, so that these excursions generally ended in a chase between the men and the deer; some good dogs would, perhaps, have been serviceable to us on these occasions. 1820. July.

Having taken on board our bower anchors and cables from the beach, on account of the difficulty we should have found in removing them after the ice began to break up, each ship placed two stream anchors on shore with hawsers from the bow and quarter, to hold them in case of any sudden motion of the ice, the pools upon which now increased very perceptibly both in depth and extent from day to day. In looking into these pools, it always appeared, during the day, as if drops of rain were falling into them; this was caused by the continual extrication of air from the ice which was thawing below, and by the rising of the bubbles to the surface. At six P.M., the atmosphere being clear and serene, the thermometer rose to 53° in the shade, but immediately on a moderate breeze springing up from the northward it fell to 45°. On the 5th and 6th, however, it stood for three hours from 50° to 52°, with a fresh breeze from the northward, accompanied by cloudy weather; and on the afternoons of the two following days, the wind being still northerly, the atmosphere continued for some time at the temperature of 55°. Mon. 3.

The dissolution of the ice of the harbour went on so rapidly in the early part of July, that we were greatly surprised, on the 6th, in finding, that in several of the pools of water, on its upper surface, holes were washed quite through to the sea beneath. On examining several of these, we found that the average thickness of the ice, in the upper part of the harbour where the ships were lying, did not exceed two feet, which was much less than we had any idea of. Towards the mouth of the harbour, however, where the water was deeper, no such holes made their appearance for some days after this. It must here be remarked, that in all cases we found the ice to be first thawed and broken up in the shoalest water, in consequence, I suppose, of the greater facility with which the ground, at a small depth below the surface of the sea, absorbed and radiated the heat of the sun's rays; and, as it is in such situations that water generally freezes the first, this circumstance seems a remarkable instance of the provision of nature for maintaining such a balance in the quantity of ice annually formed and dissolved, as shall prevent any undue or extraordinary accumulation of it in any part of the Polar regions of Thurs. 6.

1820. July. the earth. In consequence of this circumstance, we were now enabled, for the first time, to bring our boats down to the beach, so as to allow them to float about high water, in order to prevent their being split by the sun, while in every other part of the harbour, except thus near the shore, we had not the means of doing so till some days afterwards. Among the means, also, which nature employs in these regions to dissolve, during the short summer, the ice which has been formed upon the sea by the cold of winter, there appears to be none more efficacious than the numerous streams of water produced by the melting of the snow upon the land, and which, for a period of at least six or seven weeks, even in the climate of Melville Island, are constantly discharging themselves into the ocean. On this account, it would appear probable, that high land is more favourable to the dissolution and dispersion of the ice near its shores than that which is lower, because it supplies a never-ceasing flow of water during the whole of the thawing season. For instance, on the 1st of September, 1818, we found the stream in Possession Bay discharging a torrent of water into the sea, and there was still snow enough remaining on the land to keep up an abundant stream, till it should be arrested by the frost of winter; whereas, on these islands, which are very low, comparatively with the land about Possession Bay, or in Sir James Lancaster's Sound, we found, at the same season, in 1819, and much before the thawing had finished, that they were completely free from snow, the ravines entirely dry, and the whole face of the islands parched and cracked with drought, as if there had been no moisture upon the surface of the ground for some time.

On unhanging the rudders, and hauling them up on the ice for examination, we found them a good deal shaken and grazed by the blows they had received during the time the ships were beset at the entrance of Davis' Strait. We found, also, that the rudder-cases in both ships had been fitted too small, occasioning considerable difficulty in getting the rudders down when working, a circumstance by no means disadvantageous, (perhaps, indeed, rather the contrary,) on ordinary service at sea, but which should be carefully avoided in ships intended for the navigation among ice, as it is frequently necessary to unship the rudder at a short notice, in order to preserve it from injury, as our future experience was soon to teach us. This fault was, however, soon remedied, and the rudders again hung, in readiness for sea. About this time, a few flocks of looms occasionally made their appearance, invariably flying quite round the harbour, exactly over the narrow and only

strip of water which I have before described as occurring next the beach, as if looking out for food. 1820. July.

From the 7th to the 10th, a good deal of rain fell at intervals, which produced a very sensible alteration in the ice, making it look of a blue colour all over the surface, and increasing the size and number of the holes in a much greater degree than during the same interval at any other period. Mr. Reid, who returned on the 10th from his hunting-excursion to the south-west, reported, however, that he had not, during his absence, perceived the ice to be in motion, nor was there any perceptible alteration in the general mass upon the coast, except in the increase of the number of pools upon it, and in the breadth of the little channel between the ice and the land. This channel, if so it may be called, when the depth was not yet sufficient to float one of our whale-boats, was from forty to fifty yards wide in the part of the harbour next us, but much more on the northern and eastern sides, where the shoal-water extends to a greater distance from the shore. We were in hopes that the spring tides, which took place about the 11th, would have been serviceable in breaking up the ice, which now began to approach that state of rottenness, as the sailors term it, which made it dangerous to walk across the pools, as we had hitherto been accustomed to do, to avoid the trouble of going round. No sensible alteration was produced, however, by the highest tide; probably in consequence of the ice being already so completely detached from the shore, as to allow it to rise freely, and without resistance of any kind, like any other floating body; the height and velocity of the tides are here, indeed, so small, that it was not reasonable to expect much from them in this way. Mon. 10.

On the 14th a boat passed, for the first time, between the ships and the shore, in consequence of the junction of a number of the pools and holes in the ice, and on the following day the same kind of communication was practicable between the ships. It now became necessary, therefore, to provide against the possibility of the ships being forced on shore by the total disruption of the ice between them and the beach, and the pressure of that without, by letting go a bower-anchor underfoot, which was accordingly done as soon as there was a hole in the ice under the bows of each, sufficiently large to allow the anchors to pass through. We had now been quite ready for sea for some days; and a regular and anxious look-out was kept from the crow's nest for any alteration in the state of the ice, which might favour our departure from Winter Harbour, in which it now became more than probable that we were Frid. 14.

1820. July. destined to be detained thus inactively for a part of each month in the whole year, as we had reached it in the latter part of September, and were likely to be prevented leaving it till after the commencement of August.

Sun. 16. On the 16th of July the streams of water in the ravines were once more passable with great ease, and the snow had entirely disappeared, except on the sides of those ravines, and in other hollows where it had formed considerable drifts; so that the appearance of the land was much the same now as when we first made the islands in the latter part of August the preceding year. The walks which our people were enabled to take at this period, when the weather was really mild and pleasant, and to our feelings quite as warm as the summer of any other climate, together with the luxurious living afforded by our hunting parties, and by the abundant supply of sorrel which was always at command, were the means of completely eradicating any seeds of scurvy which might have been lurking in the constitutions of the officers and men, who were now, I believe, in as good health, and certainly in as good spirits, as when the Expedition left England. Gratifying as this fact could not but be to me, it was impossible to contemplate without pain the probability, now too evident, that the shortness of the approaching season of operations would not admit of that degree of success in the prosecution of the main object of our enterprise, which might otherwise have been reasonably anticipated in setting out from our present advanced station with two ships in such perfect condition, and with crews so zealous in the cause in which we were engaged.

Mon. 17. From six A.M. till six P.M. on the 17th, the thermometer stood generally from 55° to 60°; the latter temperature being the highest which appears in the Hecla's Meteorological Journal during this summer. It will readily be conceived how pleasant such a temperature must have been to our feelings after the severe winter which immediately preceded it. The month of July is, indeed, the only one which can be called at all comfortable in the climate of Melville Island.

Tues. 18. On the 18th I rowed round the harbour in a boat, in order to take the soundings as far as the ice would permit; when it was worthy of remark how exactly the extent of the clear water between the ice and the shore corresponded with its depth, it being nearly a quarter of a mile wide on the north-eastern side of the harbour, where the deepest water was from eight to ten feet; while on the western side, where we found two fathoms, the passage for the boat did not exceed forty or fifty yards in width. This channel was almost daily becoming wider, especially after a strong breeze from any

quarter causing a ripple on the sea, by which the edge of the ice was constantly washed and rapidly dissolved. My intention, therefore, at this time was, carefully to watch the increasing breadth of this open water; and, whenever a depth of three fathoms could be found, to warp the ships through it along-shore, as the only means which appeared likely to be allowed us of commencing our summer's navigation. 1820. July.

On the 20th, there being a strong breeze from the N.N.E., with fog and rain, all favourable to the dispersion of the ice, that part of it which was immediately around the Hecla, and from which she had been artificially detached so long before, at length separated into pieces, and floated away; carrying with it the collection of ashes and other rubbish which had been accumulating for the last ten months; so that the ship was now once more fairly riding at anchor, but with the ice still occupying the whole of the centre of the harbour, and within a few yards of her bows: the Griper had been set free in a similar manner a few days before. But it was only in that part of the harbour where the ships were lying that the ice had yet separated in this manner at so great a distance from the shore; a circumstance probably occasioned by the greater radiation of heat from the ships, and from the materials of various kinds which we had occasion to deposit upon the ice during the time of our equipment. Thur. 20.

Lieutenant Liddon accompanied me in a boat down the west shore of the harbour, to the southern point of the entrance, in order to sound along the edge of the ice, where we found from seven to fifteen feet water; the ice about the entrance appeared still very solid and compact, and not a single hole was at this time noticed through any of the pools upon its surface, except one which was made by a seal, and which discovered the thickness of the ice to be there between two and three feet.

Mr. Dealey, with a hunting party, returned late at night without success, having lost his way in a thick fog, that hung over the land at intervals during the day, a circumstance which did not often occur while the ships remained in harbour: we frequently, however, especially in the month of July, perceived heavy fog-banks covering the horizon in the offing, while the weather was perfectly clear near the shore.

On the 21st, Mr. Fife returned from our hunting station twelve or fourteen miles to the south-west, and reported that the appearance of the ice in that quarter was much the same as in Winter Harbour, except that the space between the ice and the land was in most parts not so broad. Frid. 21.

1820. July. There was a fresh breeze from the north-eastward, with fine clear weather, on the 22d, which made the Hecla swing round into twenty feet water astern;
Sat. 22. and the ice, being now moveable in the harbour, came home towards the shore with this wind, but not so much as to put any considerable strain on the cable of either ship; and the holding-ground being excellent, there was nothing to apprehend for their security.

During a walk which I took to the southward this day for the purpose of examining the ice near the mouth of the harbour, I was glad to find that a quantity of it had lately been forced up on the reef, by the pressure of the external ice, a proof that it had some room in which to acquire motion, and which encouraged a hope that when the wind should blow directly off the land, it might drift the ice sufficiently from the shore to afford us a navigable channel to the westward. I, therefore, went down in a boat in the afternoon, to see if any thing could be done, but found the shore so loaded with broken ice which a north-east wind had first separated and then drifted upon the beach, that I could not get so far as the south point of the entrance.

Sun. 23. A fresh gale which blew from the northward, on the morning of the 23d, caused a great alteration in the appearance of the ice near the ships, but none whatever in that in the offing, or at the mouth of the harbour, except that the shores were there more encumbered than before, owing to the quantity of pieces which were separated and driven down from the northward, so that our small boat could not succeed in getting along the shore. The north shore of the harbour was now, however, so clear as to induce me to send Lieutenant Beechey, with two boats to haul the seine, in the hope of catching some such fish as we had some time ago found upon the ice. Our fishermen, however, had little success, having brought on board only three small fish, which were all that were found in the net.

on. 24. On the 24th, the sails were bent, in readiness for our starting at a moment's notice, though, it must be confessed, that the motive for doing so was to make some show of moving, rather than any expectation which I dared to ertain of soon escaping from our long and tedious confinement; for it was ente e to conceal from the men the painful fact, that, in eight or nine impossi weeks fr this period, the navigable season must unavoidably come to a conclusio

Tues. 25. I went ay in a boat early on the morning of the 25th, in order to sound the harbour, those parts where the ice would admit the boat, with a view to take advant of the first favourable change which might present itself.

The wind having come round to the southward in the afternoon, caused the separation of a large portion of ice on the northern side of that which now occupied the harbour, and the detached pieces drifting down towards us, rendered it necessary to be on our guard lest the ships should be forced from their anchorage. On this account, as well as from an anxious and impatient desire to make a move, however trifling, from a spot in which we had now unwillingly but unavoidably passed nearly ten months, and of which we had long been heartily tired, I directed lines to be run out for the purpose of warping the ships along the ice in the centre of the harbour, and at half-past two P.M., the anchors were weighed. As soon as a strain was put upon the lines, however, we found that the ice to which they were attached came home upon us, instead of the ships being drawn out to the southward, and we were, therefore, obliged to have recourse to the kedge-anchors, which we could scarcely find room to drop, on account of the closeness of the ice. Having warped a little way out from the shore, into five fathoms and a half, it was found impossible to proceed any farther without a change of wind, and the anchors were, therefore, dropped till such a change should take place. In the course of the evening all the loose ice drifted past us to the northward, loading that shore of the harbour with innumerable fragments of it, and leaving a considerable space of clear water along shore to the southward. Our hunting parties were now recalled, and returned on board in good health in the course of this and the following day; having supplied us, during the whole time which this mode had been adopted, with a quantity of game sufficient to substitute for more than one month's established proportion of meat on board both ships. Their success had of late, however, become very indifferent, as they had not seen a deer for several days, and the birds were grown extremely shy. A herd of seven musk-oxen had lately been met with to the south-west. 1820. July.

On the morning of the 26th, it was nearly calm, with continued rain and thick weather; and there being now a space of clear water for nearly three quarters of a mile to the southward of us, we took advantage of a breeze which sprung up from the northward to weigh, at nine A.M. and run down as far as the ice would permit, and then dropped our anchors in the best births we could select, close to the edge of it, with the intention of advancing step by step, as it continued to separate by piece-meal. The ice across the entrance of the harbour as far as this spot, and the whole of that in the offing, of which we had here a commanding view from the Hecla's crow's-nest, was still Wed. 26.

1820. July. quite continuous and unbroken, with the same appearance of solidity as it had during the middle of winter, except that the pools of water were numerous upon its surface.

Thur. 27. On the 27th, the weather was clear and fine, with a strong and rather cold wind from the W.N.W., the thermometer not being higher than 37° during the day. The general temperature of the atmosphere had, indeed, before this time, begun very sensibly to decrease, and from this period the thermometer seldom stood so high as 40° in the shade during the rest of the summer. Some showers of sleet and snow prevented our sending the people on shore to pick sorrel, as they had been accustomed to do for some weeks past; this valuable plant was now on the decline, the leaves beginning to wither, and having much less of that acid taste, which constitutes its principal value.

Frid. 28. On the morning of the 28th, the wind, having shifted to the southward, was found to set the ice (close to the edge of which the Hecla had anchored) against the cable, putting some strain upon it in addition to that of the ship. We veered, therefore, to thirty fathoms, to enable the anchor to hold the better, and ranged the other cable. At half-past eight A.M. I rowed alongshore to the southward in a boat as far as the ice would allow us to go, which, however, was not a single yard beyond where Lieutenant Liddon and myself had gone, with almost equal facility, eight days before. I then landed, and walked about two miles to the southward, where I had a clear view for several miles in that direction. The space between the ice and the land between the entrance of Winter Harbour and Cape Hearne was so small that a boat could not possibly have gone that distance, even if the passage out of the harbour had been clear. The only appearance of the breaking up of the ice consisted in a quantity of it having been recently pressed up into hummocks in some places near the beach; but, upon the whole, I was compelled to admit, in my own mind, that there never was a sea which appeared less navigable. On my return, I perceived that our people were busy in the boats, and found when I got on board, that the Hecla had been forced by the ice into thirteen feet water abaft, the whole body having come home upon the cable, so as to drag the anchor. Lieutenant Beechey had, with great promptness, cut a bight or dock in the ice, and dropped the kedge in the middle of it, by which means he had, before my return on board, succeeded in getting the ship once more into four fathoms; and the small bower being then hove up, she was hauled out into seven fathoms, and the other anchor let go, after

which we lay quite securely, the wind freshening up strong from the westward at night, which kept the ice at a sufficient distance from us. 1820. July. Sat. 29.

In the mean time Lieutenant Liddon had sent me word that the Griper, which had taken her birth to the southward of ours, was not in a much more secure situation than that from which the Hecla had just escaped, the ice pressing forcibly upon her cable at times, so as to endanger her being forced on shore by it. Lieutenant Liddon very prudently, therefore, unshipped his rudder, and otherwise prepared his ship in the best manner he could for taking the beach, which is here tolerably bold, and quite soft and muddy. Happily, however, the westerly wind, which shortly after sprung up, prevented any accident of this nature.

Many of the pools of water upon the ice were slightly frozen over during the night, which had seldom been the case for several weeks before, but which now took place almost every night for the rest of the season, as soon as the sun had become low. At three P.M. another large portion of the ice near us detached itself from the main-body, and floated away to the eastward, leaving us a space of three or four hundred yards in extent clear all round the ship, of which circumstance we immediately took advantage to weigh the anchor, and shift our birth further from the shore. Sun. 30.

The wind continued fresh from the W.S.W., and at half-past seven P.M. I was informed by Mr. Palmer that a separation of the ice had just taken place in the offing, which, on going into the crow's nest, I found to consist of a lane of clear water, narrow and not altogether continuous, lying in a direction nearly parallel to that of the coast, and about three miles distant from it, being probably the boundary of the last winter's ice. From the outer point of the reef of Winter Harbour a crack commenced, and could be traced, at intervals, till it appeared to join the line of separation before described; the ice across the mouth of the harbour remained perfectly compact and unbroken, so that we could still do nothing but watch the progress of the operation which seemed at length to have commenced in earnest.

The wind being from the S.S.W. during the night, served to close the lane of water which had appeared in the offing the preceding day, which we considered a favourable circumstance, as shewing that the external mass of ice was in motion. In the course of the day, the wind shifting to the W.N.W., we once more discovered a small opening between the old and young floes, and at eleven P.M., the whole body of the ice in the harbour was perceived to be moving slowly out to the south-eastward, breaking away, for the first time, Mon. 31.

1820. July. at the points which form the entrance of the harbour. This sudden and unexpected change rendering it probable that we should at length be released, I sent to Captain Sabine, who had been desirous of continuing his observations on the pendulum to the last moment, to request he would have the clocks ready for embarkation at an early hour in the morning.

I furnished Lieutenant Liddon with instructions for his future guidance during the ensuing season of operations, appointing also certain places of rendezvous, to facilitate our meeting, in case of unavoidable separation during that period. I sent also on board the Griper, in compliance with my Instructions on that head, a chart of our late discoveries, together with a duplicate copy of every document of interest relating to the Expedition.

The latitude of the anchorage in Winter Harbour, by the mean of thirty-nine meridian altitudes, is - - - - - - - - 74° 47′ 19″.36 N.

The longitude, by the mean of six hundred and ninety-two sets of observations, consisting of six thousand eight hundred and sixty-two lunar distances - 110° 48′ 29″.2 W.

The dip of the magnetic needle - - - - - - - 88° 43′ N.

The variation - - - - - - - - - - - - - 127° 47′ 50″ E.

The mean time of high water, on the full and change days of the moon, - 1 hour 29 minutes.

The mean rise of the tides - - - { May - - - 2 feet 6½ inches. / June - - - 2 „ 7 / July - - - 2 „ 8¼.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, during the Month of *July*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	°	°	°	inches.	inches.	inches.		
1	+44	+36	+ 40.58	29.60	29.56	29.578	North.	Fresh breezes and cloudy.
2	45	36	40.50	29.70	29.62	29.657	N.N.E.	Ditto ditto.
3	53	34	43.83	29.73	29.71	29.720	North.	Light breezes and cloudy.
4	45	37	39.83	29.77	29.73	29.747	North.	Strong breezes—squalls occasionally.
5	52	37	44.33	29.83	29.75	29.775	North.	Moderate and cloudy.
6	51	43	47.67	29.83	29.75	29.787	North.	Fresh breezes and cloudy.
7	55	41	47.42	29.90	29.83	29.863	North.	Moderate and fine.
8	55	43	48.75	29.90	29.86	29.882	N.N.W.	Ditto ditto.
9	49	40	43.58	30.01	29.77	29.903	South.	Fresh breezes—occasional rain.
10	48	41	45.67	29.83	29.70	29.765	South.	Ditto ditto.
11	49	43	43.33	29.90	29.80	29.845	N.W.	Moderate and cloudy.
12	49	40	43.75	29.80	29.78	29.797	W.N.W.	Moderate with rain.
13	55	40	46.00	29.82	29.76	29.790	N. by W. to N.N.W.	Ditto ditto.
14	56	32	48.25	29.76	29.66	29.720	S.S.W.	From light to strong breezes.
15	47	38	43.00	29.79	29.68	29.710	South.	Moderate and fine.
16	49	36.5	42.87	29.76	29.72	29.753	S.S.E.	Light airs and fine clear weather.
17	60	41	51.08	29.81	29.75	29.790	North.	Ditto ditto.
18	48	34	43.12	29.84	29.69	29.788	S.S.E.	Light airs, and fine clear weather.
19	50	36	43.17	29.75	29.69	29.723	S.E.	Light airs and hazy.
20	43	38	40.50	29.70	29.60	29.623	N.N.E.	Light airs with rain.
21	45	33	40.33	29.64	29.60	29.623	N. by E.	Fresh breezes and cloudy.
22	50	37	45.04	29.69	29.66	29.675	N. N. E.	Ditto ditto.
23	43	34	39.17	29.70	29.67	29.690	North.	Ditto ditto.
24	49	36	41.83	29.71	29.60	29.678	South.	Moderate and fine.
25	50	35.5	43.58	29.59	29.31	29.453	E. by N. to S.W.	Light breezes and fine.
26	42	34	36.92	29.27	29.13	29.175	W.N.W.	Fresh breezes and cloudy—snow and rain.
27	37	32.5	34.67	29.44	29.26	29.367	W.N.W.	Ditto ((.
28	42	34	37.29	29.39	29.30	29.335	Round compass.	Light airs and cloudy.
29	38	32	34.58	29.52	29.34	29.452	S.W.	Fresh breezes and cloudy: hail and snow.
30	42	32	37.25	29.55	29.52	29.555	S.S.W. to West.	Moderate and cloudy: hail and sleet.
31	40	34.5	36.96	29.52	29.44	29.487	S.S.W. to W.N.W.	Fresh breezes and cloudy: snow and rain.
	+60	+32	+ 42.41	30.01	29.13	29.668		

CHAPTER X.

LEAVE WINTER HARBOUR—FLATTERING APPEARANCE OF THE SEA TO THE WESTWARD—STOPPED BY THE ICE NEAR CAPE HAY—FURTHER PROGRESS TO THE LONGITUDE OF 113° 48′ 22″.5, BEING THE WESTERNMOST MERIDIAN HITHERTO REACHED IN THE POLAR SEA, TO THE NORTH OF AMERICA—*BANKS'S LAND* DISCOVERED—INCREASED EXTENT AND DIMENSIONS OF THE ICE—RETURN TO THE EASTWARD, TO ENDEAVOUR TO PENETRATE THE ICE TO THE SOUTHWARD—DISCOVERY OF SEVERAL ISLANDS—RE-ENTER *BARROW'S STRAIT*, AND SURVEY ITS SOUTH COAST—PASS THROUGH SIR JAMES LANCASTER'S SOUND, ON OUR RETURN TO ENGLAND.

1820. August. Tues. 1. THE wind still blowing fresh from the northward and westward, the ice continued to drift out slowly from the harbour, till, at eight A.M., it had left the whole space between the ships and Cape Hearne completely clear, and at eleven o'clock there appeared to be water round the hummocks of ice which lie aground off that point. In the mean time, our boats were employed in embarking the clocks, tents, and observatory, while I sounded the entrance of the harbour, in order to complete the survey, which no opportunity had offered of doing before this time. At one P.M., having got every thing on board, and the ice appearing to be still leaving the shore, we weighed, and ran out of Winter Harbour, in which we had actually, as had some time before been predicted, passed ten whole months, and a part of the two remaining ones, September and August. The mind is always anxious, however, to find some ground of encouragement and hope for attaining the object of its pursuit, and we did not fail to remember, on this occasion, that short as our season of navigation must of necessity be, we were about to begin that season on the anniversary of the day on which we had commenced

our discoveries from the entrance of Sir James Lancaster's Sound westward, in the preceding year; and that if we were favoured with the same degree of success during the same period as before, there could be little doubt of the eventual accomplishment of our enterprise. 1820. August.

In running along shore towards Cape Hearne, generally at the distance of half a mile from the land, we had from ten to sixteen fathoms' water, and rounded the hummocks off the point in six and a half fathoms by three P.M. As we opened the point, it was pleasing to see that the coast to the westward of it was more clear of ice, (excepting the loose pieces which lay scattered about in every direction, but which would not very materially have impeded the navigation with a fair wind,) than it had been when we first arrived off it, a month later in the foregoing year; the main ice having been blown off by the late westerly and north-westerly winds, to the distance of four or five miles from the shore, which, from all we have seen on this part of the coast, appears to be its utmost limit. The navigable channel, with a beating wind between the ice and the land, was here from one to two or two miles and a half in width, and this seemed, from the mast-head, to continue as far as the eye could reach along-shore to the westward.

We found the wind much more westerly after we rounded the point, which made our progress slow and tedious; the more so, as we had every minute to luff for one piece of ice, and to bear up for another, by which much ground was unavoidably lost. We also found the ships to be considerably impeded by a tide or current setting to the eastward, which, as it slackened about seven in the evening, I considered to be the flood, the time of high water at Winter Harbour this day being about half-past seven. After a very few tacks, we had the mortification to perceive, that the Griper sailed and worked much worse than before, notwithstanding every endeavour which Lieutenant Liddon had been anxiously making during her re-equipment, to improve those qualities in which she had been found deficient. She missed stays several times in the course of the evening, with smooth water, and a fine working breeze; and, by midnight, the Hecla had gained eight miles to windward of her, which obliged me to heave-to, notwithstanding the increased width of the navigable channel, the weather having become hazy, so as to endanger our parting company.

At three A.M., on the 2d, the Griper having joined us, we again made sail to the westward. As, however, I could not but consider that her bad sailing had already lost us a distance of at least seven miles in the first day Wed. 2.

1820. August. after our leaving harbour; and, as it was evident that such detention must, if continued, absolutely preclude the possibility of accomplishing the main object of the Expedition, I addressed a letter to Lieutenant Liddon, desiring to be made acquainted with all the circumstances of the Griper's incapacity, that immediate steps might be taken, either for improving her trim by any means in our power, or, in the event of failing to do so, for removing her crew and provisions to the Hecla, and prosecuting the voyage in that ship singly.

During the whole forenoon of the 2d, we observed a well-defined line of ripple, at the distance of two or three miles from the land, and a few hundred yards from the edge of the ice, running parallel to the shore. We tried the current about noon, by the small boat moored to the bottom, on each side of this ripple; and found that outside, or to the southward of it, it was running to the eastward at the rate of one mile per hour, while within it, no current was perceptible. Our latitude, at noon, by an indifferent observation, was 74° 36′ 33″, and the longitude by account 110° 59′, being in forty-nine fathoms' water, on a bottom of blue clay.

Soon after noon, a breeze sprung up from the S.S.W., which being rather upon the shore, made it likely that the ice would soon begin to close it; we, therefore, began to look out for a situation where the ships might be secured in-shore, behind some of the heavy grounded ice, which had so often before afforded us shelter under similar circumstances. At one o'clock, we perceived that a heavy floe had already closed completely in with the land, at a point a little to the westward of us, preventing all hope of further progress for the present in that direction. A boat was, therefore, sent to examine the ice in-shore, and a favourable place having been found for our purpose, the ships were hauled in, and secured there, the Griper's bow resting on the beach, in order to allow the Hecla to lie in security without her. This place was so completely sheltered from the access of the main body of the ice, that I began to think seriously of taking advantage of this situation to remove the Griper's crew on board the Hecla, and had consulted the officers upon the subject. The circumstances, however, which subsequently occurred, rendering such a measure inexpedient, because no longer necessary to the accomplishment of the object in view, by which alone it could be justified, I was induced to give it up, adopting the best means in our power to remedy the evil in question.

The beach near which we were lying is so bold, that, in standing off-

and-on in the afternoon, in more than one part, we had from seven to ten fathoms at two hundred yards from the shore; to which distance, from the confidence we had acquired in the regularity of the soundings, we had no hesitation in standing as often as there was occasion to do so, and always without any apparent risk. So perfectly free from danger, indeed, is the whole of this coast, as long as the hand-leads are kept going, that it has often occurred to me as not improbable, that the annual motion of large and heavy masses of ice may in some degree prevent the accumulation of sandy shoals near the shore, where local circumstances might otherwise tend to produce them, as in other seas. 1820. August.

Shortly after our anchoring, the Griper's people heard the growling of a bear among the ice near them, but the animal did not appear; and this was the only instance of our meeting with a bear, during our stay at Melville Island, except that which followed one of our men to the ships, soon after our arrival in Winter Harbour. Both crews were sent on shore to pick sorrel, which was here not less abundant than at our old quarters, but it was now almost too old to be palatable, having nearly lost its acidity and juice. We were here a mile or two to the westward of Lieutenant Hoppner's hunting-station, and the wall which he had built round his tents, with a boarding-pike in the middle of it, was visible from the ships. The only game we obtained here consisted of a few king-ducks, some of the young of which were also procured.

The snow which fell in the night was, in the morning of the 3d, succeeded by a thick fog, which continued during the day, preventing our seeing the state of the ice to the westward. I, therefore, despatched Mr. Palmer in a boat to the point, for the purpose of ascertaining whether it was still close there. On his return in an hour, Mr. Palmer reported that no alteration had taken place since the preceding day, there not being sufficient room for the smallest boat to pass between the ice and the point, close to which he found a depth of nine fathoms. At night the wind got round to W.N.W., and afterwards to north, which made the weather clear, and gave us hopes of the ice drifting off the land. Thurs. 3.

At one A.M. on the 4th, the loose ice was observed to be drifting in upon us, the wind having veered to the eastward of north; and soon after a floe, of not less than five miles in length, and a mile and a half across, was found to be approaching the shore at a quick rate. The ships were immediately hauled as near the shore as possible, and preparation made for un-

1820. August. shipping the rudders, if necessary. The floe was brought up, however, by the masses of ice a-ground outside of us, with which it successively came in contact, and the ships remained in perfect security; the floe, as usual after the first violence is over, moved off again to a little distance from the shore. The meridian altitude of the sun gave the latitude of this station 74° 36′ 06″, and the longitude by the chronometers was 111° 16′ 39″.

At noon the heavy floe at the point near us began to quit the land, and at half-past one P.M., there being a narrow passage between them, the breadth of which the breeze was constantly increasing, we cast off and stretched to the westward. The channel which opened to us as we proceeded, varied in its general breadth from one to two miles; in some places it was not more than half a mile. The soundings were very regular, and sufficiently deep close to the shore; in one place we found twenty-three fathoms at one hundred yards from the beach, in another fourteen at sixty or seventy yards. At seven P.M., we passed the place where we had been detained so long during the preceding September, and where Mr. Fife and his party had been lost. We here seemed to be among our old acquaintance; and among these, the berg to which we had been anchored during so many days of anxiety and fruitless labour was easily recognised, as well as the pile of stones which had been erected on the hill above it. The wind was variable and squally, but we made great progress along the land to the S.W.b.W., and the Griper, by keeping up tolerably with the Hecla, in some measure redeemed her character with us. Having arrived off Cape Providence at eleven P.M., the wind became light and baffling, so that we had just got far enough to see that there was a free and open channel, beyond the westernmost point visible of Melville Island, when our progress was almost entirely stopped for want of a breeze to enable us to take advantage of it. The anxiety which such a detention occasions, in a sea where, without any apparent cause, the ice frequently closes the shore in the most sudden manner, can perhaps only be conceived by those who have experienced it. We had now, also, arrived off that part of the coast which, from Cape Providence westward, is high and steep near the sea, having no beach or shelving shore on which the heavy masses of ice can fix themselves, so as to afford security to a ship when the floes approach the land, which circumstance increased the anxiety we felt to push on, while the present opportunity offered, with all rapidity to the westward. We remarked, in sailing near the ice this evening, while the wind was blowing a fresh breeze off the land,

and therefore directly towards the ice, that it remained constantly calm within three or four hundred yards of the latter; this effect I never remember to have witnessed before, upon the windward side of any collection of ice, though it invariably happens in a remarkable degree to leeward of it. I may here mention, as a striking proof of the accuracy with which astronomical bearings of objects may be taken for marine surveys, that the relative bearing of Capes Providence and Hay, as obtained this evening when the two headlands were opening, (being $\overset{N.}{S.}\}$ 82° 38′ $\{\overset{E.}{W.}\}$) differed only one minute from that entered in the surveying-book, and found in the same manner, the preceding year. 1820. August.

We had this evening occasion to observe once more that darkness in the horizon to the southward, and as far as a S.S.W. bearing, which had been noticed from this station in 1819, and more frequently since that time, during our detention in Winter Harbour, as bearing a great resemblance to the loom of land in that quarter. We were the more inclined to the belief that there was land at no very great distance to the southward, from the conviction that there must be something which prevented the ice being drifted off the shore of Melville Island in this place more than five or six miles, with any direction or force of wind.

There was a very light air on the morning of the 5th, which died away an hour before noon, when the opportunity was taken to bring up some water from the depth of one hundred and five fathoms. Its temperature on coming to the surface was 32°, that of the surface water being 31°¼, and of the air 34°. The depth of water here was two hundred and twenty-five fathoms, on a bottom of dark brown clay, at the distance of four miles from the land; the latitude observed being 74° 21′ 49″, and the longitude by chronometers 112° 48′ 18″. Sat. 5.

At one P.M., the weather continuing quite calm, and being desirous of examining the ice in-shore, that we might be ready for the floes closing upon us, I left the ship, accompanied by Captain Sabine and Mr. Edwards, and landed near one of the numerous deep and broad ravines, with which the whole of this part of the island is indented. All the ice which was here fixed to the ground was literally upon the beach, with very deep water close alongside of it, and none of the masses projected to a sufficient distance from the shore, to afford the smallest shelter to the ships in case of accidents. We saw several white hares here, and on this and many subsequent occasions found them frequent the sides of the high banks which face the south, and

1820. August. where there is usually a plentiful vegetation for them to feed upon. We were ascending the hill, which was found by trigonometrical measurement to be eight hundred and forty-seven feet above the level of the sea, and on which we found no mineral production but sandstone and clay iron-stone, when a breeze sprung up from the eastward, bringing up the Griper which had been left several miles astern. We only stopped, therefore, to obtain observations for the longitude and the variation of the magnetic needle; the former of which was 112° 53′ 32″, and the latter 110° 56′ 11″ Easterly, and then immediately returned on board, and made all sail to the westward. After running for two hours without obstruction, we were once more mortified in perceiving that the ice, in very extensive and unusually heavy floes, closed in with the land a little to the westward of Cape Hay, and our channel of clear water between the ice and the land gradually diminished in breadth till at length it became necessary to take in the studding sails, and to haul to the wind, to look about us. I immediately left the ship, and went in a boat to examine the grounded ice off a small point of land, such as always occurs on this coast at the outlet of each ravine. I found that this point offered the only possible shelter which could be obtained, in case of the ice coming in; and I, therefore, determined to take the Hecla in-shore immediately, and to pick out the best birth which circumstances would admit. As I was returning on board with this intention I found that the ice was already rapidly approaching the shore; no time was to be lost, therefore, in getting the Hecla to her intended station, which was effected by half-past eight P.M., being in nine to seven fathoms water, at the distance of twenty yards from the beach, which was lined all round the point with very heavy masses of ice, that had been forced by some tremendous pressure into the ground. Our situation was a dangerous one, having no shelter from ice coming from the westward, the whole of which, being distant from us less than half a mile, was composed of floes infinitely more heavy than any we had elsewhere met with during the voyage. The Griper was three or four miles astern of us at the time the ice began to close, and I therefore directed Lieutenant Liddon by signal to secure his ship in the best manner he could, without attempting to join the Hecla; he accordingly made her fast at eleven P.M., near a point like that at which we were lying, and two or three miles to the eastward.

At the time of making the Hecla fast, a current was setting to the westward, at the rate of a mile and a half an hour, with a strong eddy running

into the bight where we lay; at ten P.M. it took a sudden turn, all the loose ice near us running past the ship out of the bight, and the floes outside beginning to set to the eastward, and towards the land withal. We, therefore, hauled the ship still more into the bight formed by the point, getting her into four fathoms abaft and six forward, and abreast a part of the beach where there was not quite so much heavy ice within us, to endanger the ship being crushed. This was done from a belief that, if the floes came in, the ship must inevitably be "nipped," and in this case it was better to be lying in six fathoms than nine; besides, the masses of ice now inside of us, not being so large as the rest, might possibly be forced up on the shore before the ship, instead of offering so great a resistance as to expose her to all the force of the squeeze. On the whole of this steep coast, wherever we approached the shore, we found a thick stratum of blue and solid ice, firmly embedded in the beach, at the depth of from six to ten feet under the surface of the water. This ice has probably been the lower part of heavy masses forced aground by the pressure of the floes from without, and still adhering to the viscous mud of which the beach is composed, after the upper part has, in course of time, dissolved. Captain Sabine suggested, that the underground ice found in cold countries, and to which I have before alluded, might thus have been deposited. The land gains upon the sea, as it is called, in process of time, as it has certainly done here, from the situation in which we found drift-wood and the skeletons of whales: the ice which fixes itself upon the beach is annually covered over in part by alluvial deposit, and thus may a connected stratum of it be buried for ages several feet below the surface of the earth. From the tops of the hills in this part of Melville Island a continuous line of this sub-marine ice could be distinctly traced for miles along the coast. 1820. August.

In running along the shore this evening, we had noticed near the sea what at a distance had every appearance of a high wall artificially built, and which was the resort of numerous birds. Captain Sabine, being desirous to examine it, as well as to procure some specimens of the birds, set out, as soon as we anchored, for that purpose, accompanied by his servant and Serjeant Martin. The wall proved to be composed of sand-stone in horizontal strata from twenty to thirty feet in height, which had been left standing, so as to exhibit its present artificial appearance, by the decomposition of the rock and earth about it. Large flocks of glaucous gulls had chosen this as a secure retreat from the foxes, and every other enemy but man; and when our people first

1820, August. went into the ravine in which it stands, they were so fierce in defence of their young, that it was scarcely safe to approach them till a few shots had been fired.

Sun. 6. Besides a number of gulls, Captain Sabine and his party brought with them ten hares, which, together with what we had obtained as we came along the land, furnished us with a fresh meal for the whole crew. Captain Sabine also brought me word from Lieutenant Liddon that the Griper was in a situation exactly similar to that of the Hecla, where "nipping" appeared unavoidable if the floes should come in. The ice remained quiet, however, about the Hecla during the day, even though a strong breeze freshened up from the E.S.E., with continued snow; a circumstance which, while it added to our present security, did not give us very flattering hopes that there could be any room for the ice to drift to the westward. In the course of the evening I heard again from the Griper, Lieutenant Liddon informing me that the floes had once come in towards her, so as to lift her two feet out of the water, and then retired without doing any damage. I acquainted Lieutenant Liddon with the similarity of our situation to his, and desired him not to join us at present, even should the ice open sufficiently to allow him to do so; for there was not room for the two ships where the Hecla was lying, and the chances of saving one of them from the catastrophe we had reason to apprehend, were greater by their being separate. At eleven P.M. a narrow lane of water opened near the Griper, extending about three miles to the S.S.W.; near us it had also slackened a little about midnight, but it would have been difficult to find a "hole" of water in which a boat could have floated, more than three hundred yards beyond the ship.

Mon. 7. On the morning of the 7th, a black whale (*Balæna Mysticetus*), came up close to the Hecla, being the first we had seen since the 22d of August the preceding year, about the longitude of 91°¾ W.; it therefore acquired among us the distinctive appellation of *the* whale. Since leaving Winter Harbour, we had also, on two or three occasions, seen a solitary seal. The wind continued fresh from the east and E.N.E. in the morning, and the loose ice came close in upon us, but the main body remained stationary at the distance of nearly half a mile. Considering that it might be of service to know the state of the ice further to the south and west than the view from the Hecla's mast-head would allow us, I despatched Lieutenant Beechey with one of the marines, along the top of the hills to the westward, for that purpose. At two P.M., he returned with a fawn, which gave us thirty-eight

pounds of venison, and with the information of having discovered land from W.S.W. to S.S.W. at a great distance, and the loom of it also extending as far round to the eastward as a S.E. bearing. Lieutenant Beechey considered the general distance of the land to be from forty to fifty miles, the nearest being about a S.S.W. bearing, and three capes could be plainly distinguished with a glass. The report of the state of the ice was by no means favourable to our hopes, the sea being covered with floes as far as the eye could reach, and the space between them so filled with broken ice, or the floes so closely joined, that scarcely a "hole" of water was to be seen. 1820. August.

In the afternoon, a man from each mess was sent on shore to pick sorrel, which was here remarkably fine and large, as well as more acid than any we had lately met with. The shelter from the northerly winds, afforded by the high land on this part of the coast, together with its southern aspect, renders the vegetation here immediately next the sea much more luxuriant than in most parts of Melville Island which we visited; and a considerable addition was made to our collection of plants, of which an account is given in another place.

The easterly breeze died away in the course of the day, and at three P.M., was succeeded by a light air from the opposite quarter; and as this freshened up a little, the loose ice began to drift into our bight, and that on the eastern side of the point to drive off. It became expedient, therefore, immediately to shift the ship round the point, where she was made fast in four fathoms abaft, and seventeen feet forward, close alongside the usual ledge of submarine ice, which touched her about seven feet under water, and which, having few of the heavy masses aground upon it, would, probably, have allowed her to be pushed over it, had a heavy pressure occurred from without. It was the more necessary to moor the ship in some such situation, as we found from six to seven fathoms' water, by dropping the hand-lead down close to her bow and quarter on the outer side.

We had scarcely secured the ship, when the wind once more shifted to the eastward, and the loose ice almost immediately began to move back in the opposite direction. The wind being, however, rather off the land than otherwise, I preferred remaining in our present situation, on account of the safer beach which we found here; and as there was, in other respects, little or no choice betwixt the two places, unless the wind came more on the land. At half-past ten P.M., the loose ice began to fill up the small space which

1820. August. had hitherto been clear about the ship, although the wind was at N.E., which is more off the land than we had before experienced it. Several heavy pieces of floes drove close past us, not less than ten or fifteen feet in thickness, but they were fortunately stopped by the point of land without coming in upon us. At eleven o'clock, however, a mass of this kind, being about half an acre in extent, drove in, and gave the ship a considerable "nip" between it and the land-ice, and then grazed past her to the westward. I now directed the rudder to be unhung, and the ship to be swung with her head to the eastward, so that the bow, being the strongest part, might receive the first and heaviest pressure.

Tues. 8. The ice did not disturb us again till five A.M. on the 8th, when another floe-piece came in, and gave the ship a heavy rub, and then went past, after which it continued slack about us for several hours. Every thing was so quiet at nine o'clock, as to induce me to venture up the hill abreast of us, in order to have a view of the newly-discovered land to the south-west, which, indeed, I had seen indistinctly and much refracted from the Hecla's deck in the morning. The weather being rather unfavourable, I had not so clear a view as Lieutenant Beechey, but I distinctly saw high and bold land from S. 75° W. to S. 30° W., the part most plainly visible, and appearing the nearest, being at a S. 55° W. bearing. The general distance of this land, I considered to be somewhat greater than that at which Lieutenant Beechey had estimated it, and it is placed on the chart at from sixteen to eighteen leagues from the station at which the ships were lying. This land, which extends beyond the 117th degree of west longitude, and is the most western yet discovered in the Polar Sea, to the northward of the American Continent, was honoured with the name of Banks's Land, out of respect to the late venerable and worthy President of the Royal Society, whose long life was actively engaged in the encouragement and promotion of discovery and general science.

The loom of land was frequently seen as far as a south-east bearing from the present station of the ships, which corresponds with the appearances often observed during our stay in Winter Harbour; as I have scarcely a doubt, therefore, that this forms a continuation of Banks's Land, which is, in all probability, another island of the North Georgian group, I have marked it on the chart by an unshaded line as far as the above bearing.

From the top of the hill, not a "hole" could be seen in the ice in any direction; the wind being extremely variable during the day, kept us in

a constant state of anxiety, lest the ice should come in, but it gave us no disturbance. A few hares were brought in by our sportsmen, and a dovekey was seen, being the first for this season. 1820. August.

On the morning of the 9th, a musk-ox came down to graze on the beach, near the ships. A party was despatched in pursuit, and having hemmed him in under the hill, which was too steep for him to ascend, succeeded in killing him. When first brought on board, the inside of this animal, which was a male, smelt very strongly of musk, of which the whole of the meat also tasted, more or less, and especially the heart. A description of this animal being given in the Appendix, I shall only add respecting it, that it furnished us with four hundred and twenty-one pounds of beef, which was served to the crews as usual, in lieu of their salt provisions, and was very much relished by us, notwithstanding the peculiarity of its flavour*. The meat was remarkably fat, and, as it hung up in quarters, looked as fine as any beef in an English market. A small seal, (*Phoca Vitulina*), killed by the Griper's people, was also eaten by them; and it was generally allowed to be very tender and palatable, though not very sightly in its appearance, being of a disagreeable red colour. Wed. 9.

In the morning-watch, a breeze sprung up from the westward, which we were always ready to welcome, having found that it invariably served to open the ice, while an easterly wind as constantly made it closer. This was, however, of short duration, being succeeded soon after noon by a light air from the south-east, which brought all the loose ice into our bight. At half-past three P.M., a large piece of a very heavy floe came close to us, and would have given us a "nip" against the shore, had we not avoided it by heaving the ship a few yards a-head in good time. It was then brought up by the point of land, and remained quietly half a cable's length astern of us, there not being room for it to drift farther to the westward between the point and an enormous floe which blocked up the passage to the southward and westward.

At ten P.M., the whole body of ice which was then a quarter of a mile from us, was found to be drifting in upon the land, and the ship was warped back a little way to the westward, towards that part of the shore, which was most favourable for allowing her to be forced up on the beach. At eleven

* Some pieces of this meat, which we brought to England, were found to have acquired a much more disagreeable flavour than when first killed, though they had not undergone putrefaction in the slightest degree.

1820. August. o'clock, the piece of a floe, which came near us in the afternoon, and which had since drifted back a few hundred yards to the eastward, received the pressure of the whole body of ice, as it came in. It split across in various directions, with a considerable crash, and presently after we saw a part, several hundred tons in weight, raised slowly and majestically, as if by the application of a screw, and deposited on another part of the floe from which it had broken, presenting towards us the surface that had split, which was of a fine blue colour, and very solid and transparent. The violence with which the ice was coming in being thus broken, it remained quiet during the night, which was calm, with a heavy fall of snow.

Thur. 10. The mass of ice which had been lifted up the preceding day, being drifted close to us on the morning of the 10th, I sent Lieutenant Beechey to measure its thickness, which proved to be forty-two feet; and, as it was a piece of a regular floe, this measurement may serve to give some idea of the general thickness of the ice in this neighbourhood. There were some, however, which were of much larger dimensions; an immense floe which formed the principal, or at least the nearest, obstruction to the westward, was covered with large hummocks, giving to its upper surface the appearance of hill and dale, somewhat in this manner:

The thickness of this floe at its nearest edge was six or seven feet above the sea, and as about six-sevenths are usually immersed, the whole thickness would appear, in the common way of reckoning it, to have been from forty to fifty feet, which corresponds with that actually measured by Lieutenant Beechey. But the hummocks were many of them at least from fifteen to twenty-five feet above the sea; so that the solidity and thickness of this enormous floe must have been infinitely greater than any thing we had seen before. It was the opinion of Lieutenant Beechey, and of Messrs. Allison and Fife, that it very much resembled the ice met with at Spitzbergen; but, according to the account of the two latter, was much heavier than any which they had seen there: Lieutenant Beechey considered that there was much more snow upon the surface of the Spitzbergen ice. It is here of some importance to notice, that the "loose ice" in this neighbourhood was on the same increased scale as the floes, so that the danger

to be apprehended from the violent contact of one of these pieces was little less than that from a floe of ordinary size, such as occurs in Baffin's Bay. This circumstance, also, very materially altered the character of the navigation on that part of the coast, for the loose pieces being most of them of infinitely greater bulk and weight in the water than either of our ships, the latter could no longer turn them out of their way, as usual, in sailing among this kind of ice, but were invariably stopped short in their progress, with a violent concussion, which nothing but their extraordinary strength could have enabled them to withstand. 1820. August.

It now became evident, from the combined experience of this and the preceding year, that there was something peculiar about the south-west extremity of Melville Island, which made the icy sea there extremely unfavourable to navigation, and which seemed likely to bid defiance to all our efforts to proceed much farther to the westward in this parallel of latitude. We had arrived off it on the 17th of September, 1819, after long and heavy gales from the north-westward, by which alone the ice is ever opened on this coast, and found it, in unusually heavy and extensive fields, completely closing in with the land, a mile or two to the eastward of where we were now lying. We again arrived here in the early part of August, and though the rest of the navigation had been remarkably clear for the fifty miles between this and Winter Harbour, seeming to afford a presumptive proof, that the season was rather a favourable one than otherwise, the same obstruction presented itself as before; nor did there appear, from our late experience, a reasonable ground of hope, that any fortuitous circumstance, such as an alteration in winds or currents, was likely to remove the formidable impediments which we had now to encounter. The increased dimensions of the ice hereabouts would not alone have created an insurmountable difficulty in the navigation, but that it was very naturally accompanied by a degree of closeness which seldom or never admitted an open space of clear water of sufficient size for a ship, or even a boat, to sail in. We had been lying near our present station with an easterly wind blowing fresh for thirty-six hours together; and although this was considerably off the land, beyond the western point of the island now in sight, the ice had not, during the whole of that time, moved a single yard from the shore; affording a proof that there was no space in which the ice was at liberty to move to the westward, and offering a single and a striking exception to our former experience.

1820. August. Under these circumstances, I began to consider whether it would not be advisable, whenever the ice would allow us to move, to sacrifice a few miles of the westing we had already made, and to run along the margin of the floes, in order to endeavour to find an opening leading to the southward, by taking advantage of which we might be enabled to prosecute the voyage to the westward in a lower latitude. I was the more inclined to make this attempt, from its having long become evident to us, that the navigation of this part of the Polar Sea is only to be performed by watching the occasional openings between the ice and the shore; and that, therefore, a continuity of land is essential, if not absolutely necessary, for this purpose. Such a continuity of land, which was here about to fail us, must necessarily be furnished by the northern coast of America, in whatsoever latitude it may be found; and, as a large portion of our short season had already been occupied in fruitless attempts to penetrate further to the westward in our present parallel, under circumstances of more than ordinary risk to the ships, I determined, whenever the ice should open sufficiently, to put into execution the plan I had proposed.

The westerly wind cleared us by slow degrees of the loose masses of ice about the ship, and in the afternoon the main body went off about three hundred yards, drifting also a little to the eastward. It may always be expected, in icy seas, that a breeze of wind, however light, will set the ice in motion, if there be any room for it to move; in such cases, the smaller pieces of course begin to drift the first, and the heavier ones soon follow, though at a slower rate: among loose ice, therefore, almost every separate piece is seen to move with a different velocity, proportioned to its depth under water.

Having gone on shore in the evening to make some observations for the variation, I afterwards ascended the hill, in order to take a view of the state of the ice in the offing. The breeze had now begun to open several "holes," particularly in the west and south-east quarters; it was most loose in the latter direction, except close along the land to the eastward, where a ship might possibly have been got, had this been our immediate object. The ice, however, looked just as promising to the westward as in any other quarter, and I found, before I returned on board, that it continued to drift to the eastward, and to leave more and more space of clear water in the required direction. I, therefore, communicated to Lieutenant Liddon my intention of pushing on to the westward the instant the sea became clear enough for the

ships to make any progress with a beating wind; but, in the event of failing to do so, that I should next try what could be done by attempting a passage considerably to the southward of our present parallel. 1820. August.

At seven P.M., we shipped the rudder, and crossed the top-gallant yards, in readiness for moving; and I then again ascended the hill, and walked a mile to the westward, along the brow of it, that not a moment might be lost, after the ice to the westward should give us the slightest hope of making any progress by getting under-way. Although the holes had certainly increased in size and extent, there was still not sufficient room even for one of our boats to have worked to windward; and the impossibility of the ships' doing so was rendered more apparent, on account of the current which, as I have before had occasion to remark, is always produced in these seas, soon after the springing up of a breeze, and which was now running to the eastward, at the rate of at least one mile per hour. It was evident, that any attempt to get the ships to the westward must, under circumstances so unfavourable, be attended with the certain consequence of their being drifted the contrary way; and nothing could, therefore, be done but still to watch, which we did most anxiously, every alteration in the state of the ice. The wind, however, decreasing as the night came on, served to diminish the hopes with which we had flattered ourselves of being speedily extricated from our present confined and dangerous situation. At half-past ten P.M., Lieutenant Beechey, at my request, ascended the hill; and, on his return at eleven o'clock, reported that, "the ice was slack from W.b.N. to W.S.W., but that, without a leading wind, it did not appear that a ship could make any way among it."

At one A.M., on the 11th, I despatched Mr. Ross to the top of the hill, from whence he observed, that "the ice had slackened considerably from W.b.S. to south, but was still too close for a ship to work among it." At this time the wind was dying away gradually; and, at four A.M., when Mr. Ross again ascended the hill, it had fallen quite calm. The ice immediately ceased to drift to the eastward, and at half-past five, a light breeze springing up from the south-east, caused it at once to return in the opposite direction. Being desirous, if possible, to take advantage of this breeze, Lieutenant Beechey and myself again went on shore, in order to form a judgment whether there was room for the ships to sail among the ice, should it appear otherwise expedient to get them under-way. We agreed that it was by no means practicable with the present light wind, which would scarcely have Frid. 11.

1820. August. given them steerage-way, even in a clear and unincumbered sea, and much less, therefore, could have enabled them to force their way through the numberless heavy masses which lay in our way to the westward. So close, indeed, did the ice about us still continue, that it was necessary to shift the Hecla once more round to the westward of the point of land, to secure her from that which the change of wind was once more bringing back in great abundance, and at the rate of nearly a mile per hour. In an hour after we had effected this, I had reason to be satisfied with the determination to which I had come, of not getting the ships under-way, for there was literally not a single "hole" of open water visible from the mast-head, in which a boat would have floated, except immediately under the lee of the point where we were lying, and within one hundred yards of the ship.

The latitude observed at our present station was 74° 25′ 35″, the longitude, by chronometers, 113° 43′ 01″, and the variation of the magnetic needle, 106° 06′ 38″ Easterly, each of these being the mean of several observations taken on different days. There was nothing in the appearance or productions of this part of the island different from those which had been found elsewhere, except that the ravines were more strikingly grand and picturesque, in consequence of the greater height of the land upon this part of the coast: this, as I have before remarked, was found, in one instance, to exceed eight hundred feet above the level of the sea; and the hills, immediately at the back of this, at the distance of nine or ten miles, appeared to be at least one or two hundred feet higher; so that the extreme height of Melville Island, as far as we had an opportunity of seeing it, may, perhaps, be fairly estimated at about one thousand feet. The rocks consisted entirely of sandstone in horizontal strata, and the soil of sand, intermixed occasionally with decayed plants, forming here and there a sort of vegetable mould, on which the other plants, and a few tufts of very luxuriant moss, were growing: we remarked, that almost the whole of the plants had a part of their flowers cropped by the hares, and other animals which are fond of feeding in the sheltered and warm situations afforded by the banks next the sea.

The weather was foggy for some hours in the morning, but cleared up in the afternoon, as the sun acquired power. The wind increased to a fresh gale from the eastward, at nine P.M., being the second time that it had done so, while we had been lying at this station; a circumstance which we were the more inclined to notice, as the easterly winds had hitherto been more

faint and less frequent than those from the westward. In this respect, therefore, we considered ourselves unfortunate, as experience had already shewn us, that none but a westerly wind ever produced upon this coast, or, indeed, on the southern coast of any of the North Georgian Islands, the desired effect of clearing the shores of ice. 1820. August.

At nine P.M., Lieutenant Beechey could discover from the top of the hill no clear water in any direction. After ten o'clock the wind blew much harder, which obliged us to strike the top-gallant yards, and to brace the yards to the wind; the ice had by this time ceased moving to the westward, having apparently, as before, reached its *ne plus ultra* in that direction. The electrometer was tried in the course of the evening, in the usual manner, the sky being full of hard dense clouds, and the wind blowing strong; but no sensible effect was produced upon the gold leaf.

The gale continued strong during the night, and the ice quite stationary. Sat. 12. Not a pool of clear water could be seen in any direction, except just under the lee of our point, where there was a space large enough to contain half a dozen sail of ships, till about noon, when the whole closed in upon us without any apparent cause, except that the wind blew in irregular puffs about that time, and at one P.M. it was alongside. The ship was placed in the most advantageous manner for taking the beach, or rather the shelf of submarine ice, and the rudder again unshipped and hung across the stem. The ice which came in contact with the ship's side consisted of very heavy loose pieces, drawing twelve or fourteen feet water, which, however, we considered as good "fenders," comparatively with the enormous fields which covered the sea just without them. So much, indeed, do we judge at all times by comparison, that this kind of ice, which in Davis' Strait we should not like to have had so near us, was now considered of infinite service, when interposed between the ship and the heavier floes. Every thing remained quiet for the rest of the day, without producing any pressure of consequence; the wind came round to N.b.E. at night, but without moving the ice off the land.

Early in the morning of the 13th, I received, by Mr. Griffiths, a message Sun. 13. from Lieutenant Liddon, acquainting me that at eleven o'clock on the preceding night the ice had been setting slowly to the westward, and had at the same time closed in upon the land where the Griper was lying, by which means she was forced against the submarine ice, and her stern lifted two feet out of the water. This pressure, Lieutenant Liddon remarked, had given her a twist which made her crack a good deal, but apparently without suf-

1820. August. fering any material injury in her hull, though the ice was still pressing upon her when Mr. Griffiths came away. She had at first heeled inwards, but on being lifted higher, fell over towards the deep water. Under these circumstances, Lieutenant Liddon had very properly landed all the journals and other documents of importance, and made every arrangement in his power for saving the provisions and stores, in case of shipwreck, which he had now every reason to anticipate. Convinced as I was that no human art or power could, in our present situation, prevent such a catastrophe, whenever the pressure of the ice became sufficient, I was more than ever satisfied with the determination to which I had previously come, of keeping the ships apart, during the continuance of these untoward circumstances, in order to increase the chance of saving one of them from accidents of this nature. I, therefore, thought it right merely to direct Lieutenant Liddon's attention to the necessity of saving the provisions and fuel, in preference to any other species of stores, and established signals to be made upon the point of land which intervened between the ships, in case of any thing occurring. In the mean time, the ice remained so close about the Hecla, that the slightest pressure producing in it a motion towards the shore, must have placed us in a situation similar to that of the Griper; and our attention was, therefore, diverted to the more important object of providing, by every means in our power, for the security of the larger ship, as being the principal depôt of provisions and other resources.

At five P.M. Lieutenant Liddon acquainted me by letter, that the Griper had at length righted, the ice having slackened a little around her, and that all the damage she appeared to have sustained was in her rudder, which was badly split, and would require some hours' labour to repair it, whenever the ice should allow him to get it on shore. He also stated that, from the particular situation into which the Griper had been forced, and of the masses of ice immediately about her, a westerly wind, though it might eventually clear the shore, would in the first place subject her to another squeeze like that from which she had just been so opportunely released. Lieutenant Beechey observed from the hill, in the course of the day, that the ice was so compact as not to leave an opening in any direction, and that it was set so close against the shore, that nothing could have passed between them. It had moved off a few yards from the Hecla for two or three hours, and in the evening closed again, so as to press her firmly against the land, though without any material strain. This pressure arose principally from the ap-

proach of the large block of ice which I have described as having been raised up on the 9th, and which, having been frequently drifted backwards and forwards past the ship since that time, had once more stationed itself rather nearer to us than we could have wished. I may here remark that this mass, of which we knew the dimensions by actual measurement, served, when driving among the heavy floes in the offing, as a standard of comparison, by which the height of the latter above the sea, and thence their whole bulk, could be estimated with tolerable accuracy; and it was principally in this manner that a judgment was formed of those enormous fields with which this part of the sea was incumbered. There was a very light air from the southward and eastward for the greater part of the evening, and a fog came on as the atmosphere cooled at night. 1820. August.

Soon after midnight the ice pressed closer in upon the Hecla than before, giving her a heel of eighteen inches towards the shore, but without appearing to strain her in the slightest degree. Most of the boats had been lowered down, and securely moored upon the beach, to prevent their being damaged, should the ship be forced upon her broadside, and the rest were now placed in a similar situation. By four P.M., the pressure had gradually decreased, and the ship had only three or four inches heel; in an hour after she had perfectly righted, and the ice remained quiet for the rest of the day. A light easterly wind, with small snow at times, continued till six A.M., when it died away, and was soon after succeeded by a gentle air from the westward. Mon. 14.

Mr. Fisher tried an experiment on the specific gravity of a piece of floe-ice taken up from alongside the ship, by which it appeared to be heavier than that we had hitherto weighed in the same manner. Being formed into a cube, whose sides measured one foot two inches and seven-tenths, and placed to float in the sea, only one inch and eight-tenths of it remained above the surface. The temperature of the sea-water at the time, was 34°, and its specific gravity 1.0105.

The weather became foggy, with small rain in the afternoon; before the fog came on, however, Mr. Ross observed from the hill that the same unvaried surface of impenetrable ice, as before, presented itself in every direction; and a note from Lieutenant Liddon acquainted me that no alteration had lately taken place in the neighbourhood of the Griper.

Every moment's additional detention now served to confirm me in the opinion I had formed, as to the expediency of trying, at all risks, to penetrate to the southward, whenever the ice would allow us to move at all,

1820. August. rather than persevere any longer in the attempts we had been lately making with so little success, to push on directly to the westward. I, therefore, gave Lieutenant Liddon an order to run back a certain distance to the eastward, whenever he could do so, without waiting for the Hecla, should that ship be still detained; and to look out for any opening in the ice to the southward, which might seem likely to favour the object I had in view, waiting for me to join him, should any such opening occur.

The westerly breeze freshening up, with continued snow, the ice about the ship began to move at seven P.M. The usual superficial current was soon observed to make, carrying with it to the eastward the loose and broken fragments of ice. At eight o'clock the heavier masses had also acquired motion, and it became necessary to shelter the Hecla from their approach by shifting her once more to the eastward of the point. In doing this, we found the current at the extreme point running at the rate of two, or two and a half miles an hour, so as to require great caution in laying out our warps to prevent the ship being carried back to the eastward; and this not three hours after it had first begun to make. The frequent experience we had of the quickness with which currents are thus formed, in consequence merely of the wind setting the various bodies of ice in motion, naturally leads to this useful caution, that one or two trials of the set of the stream in icy seas must not be too hastily assumed in drawing any conclusion as to its constant or periodical direction. I am convinced, indeed, that, of all the circumstances which render the navigation among ice so precarious and uncertain, there is none so liable to constant alteration, and on which, therefore, so little dependence can be placed, as an indication of the existence of a passage in this or that direction, as the set and velocity of the superficial currents.

Tues. 15. The breeze died away in the course of the night, just as the ice was beginning to separate, and to drift away from the shore; and, being succeeded by a wind off the land, which is here very unusual, Lieutenant Liddon was enabled to make sail upon the Griper at two A.M. on the 15th, in execution of the orders I had given him. As I soon perceived, however, that she made little or no way, the wind drawing more to the eastward on that part of the coast, and as the clear water was increasing along the shore to the westward, much farther than we had yet seen it, I made the signal of recall to the Griper, with the intention of making another attempt, which the present favourable appearances seemed to justify, to push forward

without delay in the desired direction. At five A.M., therefore, as soon as the snow had cleared away sufficiently to allow the signal to be distinguished, we cast off, and ran along shore, the wind having by this time veered to the E.b.N., and blowing in strong puffs out of the ravines as we passed them. We sailed along, generally at the distance of a hundred or a hundred and fifty yards from the beach, our soundings being from ten to seventeen fathoms; and, after running a mile and a half in a N.W.b.W. direction, once more found the ice offering an impenetrable obstacle to our progress westward, at a small projecting point of land just beyond us. We, therefore, hauled the ship into a birth which we were at this moment fortunate in finding abreast of us, and where we were enabled to place the Hecla within a number of heavy masses of grounded ice, such as do not often occur on this steep coast, and which, comparatively with the situation we had lately left, appeared a perfect harbour. In the mean time, the wind had failed our consort, when she was a mile and a half short of this place; and Lieutenant Liddon, after endeavouring in vain to warp up to us, was obliged, by the ice suddenly closing upon him, to place her in-shore in the first situation he could find, which proved to be in very deep water, as well as otherwise so insecure, as not to admit a hope of saving the ship, should the ice continue to press in upon her. It now became of essential importance to endeavour to get the Hecla so far into security in her present situation, as to allow of assistance being sent to the Griper in case of accidents. With this view, I assembled the officers and ship's company, and having acquainted them with my intention, caused such arrangements to be made for sending parties round, accompanied by proper officers, as might prevent confusion whenever that measure became necessary. The plan proposed was, to cut large scuttles or holes in the decks, if time were allowed for doing so, whenever the wreck of the ship should appear to be unavoidable, in order to allow the casks of provision to float up out of the hold, as in any other case they must have sunk with the ship, in deep water. The Hecla's crew were set to work to saw off some thick tongues of ice, which prevented her going into a sort of "natural dock," as the sailors term it, formed by the masses of grounded ice; a tedious and cold operation, which they performed with their usual alacrity, and thus placed the ship in complete security. I then walked round to the Griper, to acquaint Lieutenant Liddon with the arrangements that had been made, and to consult with him as to the other means to be adopted for her safety, and the preservation of the stores. We were

1820. August.

1820. August. shortly afterwards, however, relieved from any further apprehension on this account, by the ice gradually receding from the shore, in consequence of a westerly breeze springing up, and allowing the Griper to warp up near the Hecla, where, though she was by no means so safe as that ship, she was at least placed in a situation, with which the extraordinary nature of our late navigation taught us to be satisfied.

Mr. Fisher found very good sport in our new station, having returned in the evening, after a few hours' excursion, with nine hares; the birds had, of late, almost entirely deserted us, a flock or two of ptarmigan and snow-buntings, a few glaucous gulls, a raven, and an owl, being all that had been
Wed. 16. met with for several days.

A fog which had prevailed during the night, cleared away in the morning of the 16th, and a very fine day succeeded, with a moderate breeze from the westward. In order to have a clear and distinct view of the state of the ice, after twenty-four hours' wind from that quarter, Captain Sabine, Mr. Edwards, and myself, walked about two miles to the westward, along the high part of the land next the sea, from whence it appeared but too evident that no passage in this direction was yet to be expected. The only clear water in sight was a channel of about three-quarters of a mile wide in some places, between the ice and the land, extending as far as a bold headland, bearing N. 52° W., distant two miles and a quarter, which formed the western extreme in sight, and was called Cape Dundas, as appropriate to the name which the island had received. The ice to the west and south-west was as solid and compact, to all appearance, as so much land; to which, indeed, the surface of many of the fields, from the kind of hill and dale I have before endeavoured to describe, bore no imperfect resemblance. I have no doubt that, had it been our object to circumnavigate Melville Island, or, on the other hand, had the coast continued its westerly direction instead of turning to the northward, we should still have contrived to proceed a little occasionally, as opportunities offered, notwithstanding the increased obstruction which here presented itself; but as neither of these was the case, there seemed little or nothing to hope for from any further attempts to prosecute the main object of the voyage in this place. I determined, therefore, no longer to delay the execution of my former intentions, and to make trial, if possible, of a more southern latitude, in which I might follow up the success that had hitherto attended our exertions.

The place to which we had now walked, was the eastern bank of the

largest ravine we had ever seen upon the island; its width at the part next the sea being above half a mile, and its sides, which are nearly perpendicular, not less than eight hundred feet in height. In watching the little stream, not more than a yard or two wide and a few inches in depth, now trickling along the bottom of this immense water-course, it was impossible not to be forcibly struck with the consideration of the time which must have been required, with means apparently so inadequate, to hew out so vast a bed for the annual discharge of the winter's snow into the ocean. We here met with no other mineral than sandstone; the formation of the rocks, as far as we could see them in the ravines, here and there resembled large upright masses, or square pillars, standing amidst the *debris* which surrounded them; in other places, a range of sandstone, in thin horizontal strata, was left in the same manner, having all the appearance of a wall artificially constructed, and on these a square part sometimes occurred, higher than the rest, not unlike chimneys, for which, in an inhabited country, they might easily have been taken at a little distance. In some of the higher parts of the land, upon the brink of the precipice which overlooks the sea, we remarked almost the first commencement of ravines, consisting of small channels a yard or two in depth, and which, as we then amused ourselves by reflecting, may one day resemble those immense beds which constitute the most sublime and picturesque feature that this island can boast. I have before remarked that, at the outlet of these ravines, there is always a small point of land, formed by the soil and stones which are there carried into the ocean; I repeat this observation, for the sake of adding that, in cases of danger from the sudden closing of the ice, a ship may always be sure of meeting with one of these points, which are too small to be seen at a distance, or to be delineated on the chart, by steering for one of the ravines, the latter being easily distinguishable when several miles from the land. 1820. August.

The station at which the ships were now lying, and which is the westernmost point to which the navigation of the Polar Sea to the northward of the American continent has yet been carried, is in latitude 74° 26′ 25″, and longitude, by chronometers, 113° 46′ 43″.5. Cape Dundas is in latitude 74° 27′ 50″, longitude 113° 57′ 35″, by which the length of Melville Island, in an E.N.E. and W.S.W. direction, appears to be about one hundred and thirty-five miles, and its breadth, about the meridian of Winter Harbour, from forty to fifty miles.

1820. August. At two P.M. we cast off from the shore, and ran close along the edge of the ice to the eastward, the general distance from the land being a mile and a half for the first four or five miles, and then gradually much closer. I acquainted the officers with the object I had now in view, and directed a vigilant look-out to be constantly kept for any opening in the ice that might favour our getting to the southward. The wind died away after five P.M., and then became extremely variable, shifting in "cat's paws" from one point to another as quickly as we could trim the sails. At nine P.M. we were abreast the place where we had landed on the 5th, and here we perceived that the ice closed in with the land a little to the eastward. There was no security to be found for the ships without getting past one of the small points at the mouth of a ravine, against which a floe was setting the smaller pieces of ice, and had blocked up the passage before we arrived at it. After two hours' labour in heaving with hawsers, during which the Hecla narrowly escaped a severe "nip" by the sudden closing of the ice, we succeeded in getting through, and, soon after midnight, made the ships fast to some very heavy grounded ice near the beach. We observed a number of hares feeding on the sides of the cliffs, as we sailed along in the afternoon, and also a few ptarmigan.

Thur. 17. The place where the Hecla was now secured, being the only one of the kind which could be found, was a little harbour formed, as usual, by the grounded ice, some of which was fixed to the bottom in ten to twelve fathoms. One side of the entrance to this harbour consisted of masses of floes, very regular in their shape, placed quite horizontally, and broken off so exactly perpendicular, as to resemble a handsome well-built wharf. On the opposite side, however, the masses to which we looked for security were themselves rather terrific objects, as they leaned over so much towards the ship, as to give the appearance of their being in the act of falling upon her deck; and as a very trifling concussion often produces the fall of much heavier masses of ice, when in appearance very firmly fixed to the ground, I gave orders that no guns should be fired near the ship during her continuance in this situation. The Griper was of necessity made fast near the beach, in rather an exposed situation, and her rudder unshipped, in readiness for the ice coming in; it remained quiet, however, though quite close, during the day, the weather being calm and fine. The latitude observed here was 74° 24′ 50″, the longitude 112° 38′ 55″, and the variation of the magnetic needle 111° 19′ 15″ easterly.

The weather became foggy at night; the young ice, which had, for several evenings past, begun to form upon the surface of the sea, as the sun became low, did not thaw during the whole of this day. Mr. Fisher was again successful in his sporting excursion, bringing in nine hares, the greater part of which were still beautifully white; about a dozen young ptarmigan were also killed in each ship. The vegetation in this neighbourhood was much the same as in our last station; the sorrel had now become too insipid to be at all palatable. 1820. August.

On the 18th the weather was alternately clear and cloudy, with a slight air of wind from the S.W. The ice continued close to the land as far as we could see in both directions, and without the smallest perceptible motion till the evening, when it slackened a little along the shore. I immediately despatched Mr. Nias to Cape Providence, which was still two miles and a half to the eastward of us, to examine the appearance of the ice beyond it. He reported, on his return, that it was slack at the distance of two hundred yards from the shore, as far as the Cape, but that to the eastward there was no appearance of clear water. As there was not the smallest security for the ships for the next three or four miles along the shore, it was necessary still to continue in our present place of refuge. Frid. 18.

It was again nearly calm on the 19th, and the weather was foggy for some hours in the morning. In the evening, having walked to Cape Providence, to see if there was any possibility of moving the ships, I found the ice so close that a boat could not have passed beyond the Cape; but a light air drifting the ice slowly to the eastward at this time, gave me some hopes of soon being enabled to make our escape from this tedious as well as vexatious confinement. At a quarter past eight it was high-water by the shore; about this time the ice ceased driving to the eastward, and shortly after returned in the opposite direction. This coincidence, if it be only such, seemed in some degree to confirm what I had hitherto considered to be the case with respect to the flood-tide coming from the westward upon this coast; but it may, perhaps, have been occasioned only by the usual superficial current, as a light air sprung up from the eastward about that time. Sat. 19.

At half-past eleven P.M., some heavy pieces of the grounded ice, to which our bow-hawser was secured, fell off into the water, snapping the rope in two, without injuring the ship. As, however, every alteration of this kind must materially change the centre of gravity of the whole mass, which already appeared in a tottering state, I thought it prudent to move the Hecla out of

1820. August. her harbour to the place where the Griper was lying, considering that a ship might easily be forced on shore by the ice without suffering any serious damage; but that one of those enormous masses falling upon her deck must inevitably crush or sink her.

Sun. 20. The weather being again calm on the 20th and 21st allowed the "young ice" to form upon the surface to such a degree as firmly to cement together the loose pieces which hung about the ships; and it did not thaw during those days, though the sun was shining clearly upon it for several hours. Although this alone was sufficient to deter me from moving the ships, without a fresh breeze of wind, I was anxious to know the state of the ice to the eastward, and I, therefore, sent Mr. Nias to the Cape on the evening of the 21st, to examine it with a glass. On his return he acquainted me that no alteration had taken place, the whole body of the ice remaining still close in with the shore, and perfectly compact and impenetrable to the eastward, as well as to the south.

Tues. 22. On the 22d, the ice still remained as close as before, more so indeed as, on the failure of a light breeze which had been blowing from the westward for an hour or two, and had amused us with hopes of getting away, the loose ice surrounded us completely, so that we were immoveably beset. Calm weather is observed always to make ice open out, and occupy more space than it had done before, as if the previous breeze had been acting on an elastic substance, which springs back as soon as the force of the wind is removed from it.

Wed. 23. The "young ice" had increased to the thickness of an inch and a half on the morning of the 23d, and some snow which had fallen in the night served to cement the whole more firmly together. On a breeze springing up from the westward, however, it soon began to acquire a motion to leeward, and, at half an hour before noon, had slackened about the ships sufficiently to allow us to warp them out, which was accordingly done, and all sail made upon them. The wind having freshened up from the W.N.W., the ships' heads were got the right way, and by great attention to the sails, kept so till they had got abreast of Cape Providence, after which they were no longer manageable, the ice being more close than before. I have before remarked that the loose ice in this neighbourhood was heavy in proportion to the floes from which it had been broken; and the impossibility of sailing among such ice, most of which drew more water than the Hecla, and could not therefore be turned by her weight, was this day

Drawn & Engraved by W. Westall A.R.A. from a Sketch made on the spot by Lieut. Hoppner.

Situation of H. M. Ships Hecla & Griper, from the 17.th to the 23.rd of Aug.t 1820

Published by John Murray, London, March 6 1821

Drawn & Engraved by W. Westall A.R.A. from a Sketch by Lieut. Beechey.

Musk Bull Melville Island

rendered very apparent, the ships having received by far the heaviest shocks which they experienced during the voyage. They continued, however, to drive till they were about three miles to the eastward of Cape Providence, where the low land commences; when finding that there was not any appearance of open water to the eastward or southward, and that we were now incurring the risk of being beset at sea, without a chance of making any farther progress, we hauled in for the largest piece of grounded ice we could see upon the beach, which we reached at six P.M., having performed six miles of the most difficult navigation I have ever known among ice. The Hecla was made fast in from eighteen to twenty feet water close to the beach, and the Griper in four fathoms, about half a mile to the westward of us. 1820. August.

The situation in which the ships were now placed, when viewed in combination with the shortness of the remaining part of the season, and the period to which our resources of every kind could be extended, was such as to require a more than ordinary consideration, in order to determine upon the measures most proper to be pursued, for the advancement of the public service and the security of the ships and people committed to my charge. Judging from the close of the summer of 1819, it was reasonable to consider the 7th of September as the limit beyond which the navigation of this part of the Polar Sea could not be performed, with tolerable safety to the ships, or with any hope of further success. Impressed, however, with a strong sense of the efforts which it became us to make in the prosecution of our enterprise, I was induced to extend this limit to the 14th of September, before which day, on the preceding year, the winter might fairly be said to have set in. But even with this extension our prospect was not very encouraging: the direct distance to Icy Cape was between eight and nine hundred miles, while that which we had advanced towards it this season, fell short of sixty miles.

I have already detailed the reasons which inclined me to believe, that there was little hope of making further progress to the westward in this latitude, and the grounds upon which I had determined to run along the edge of the ice to the eastward. Such, however, was the extreme difficulty with which we were enabled to navigate the ships in this, or any other, direction, that it had for many days been equally out of our power to effect this object. Indeed, we had experienced, during the first half of the navigable season, such a continued series of vexations, disappointments and delays, accompanied by such a constant state of danger to the ships, that I felt it would

1820. August. no longer be deemed justifiable in me to persevere in a fruitless attempt to get to the westward.

By Mr. Hooper's report of the remains of provisions, it appeared that, at the present reduced allowance, (namely, two-thirds of the established proportion for the navy), they would last until the 30th of November, 1821; and that an immediate reduction to half allowance, which must, however, tend materially to impair the health and vigour of the officers and men, would only extend our resources till the 30th of April, 1822; it therefore became a matter of evident and imperious necessity, that the ships should be cleared from the ice before the close of the season of 1821, so as to reach some station where supplies might be obtained by the end of that, or early in the following, year.

By the same report, it appeared that the fuel, with which we were furnished, could only be made to extend to a period of two years and seven months, or to the end of November, 1821; and this only by resorting to the unhealthy measure of both crews' living on board the Hecla, during six of the ensuing winter months. The above calculation was made according to the proportion of fuel hitherto consumed on board each ship, varying at different periods of the year, from one and a half to three bushels of coal per day,—a quantity which, far from affording the officers and men comfort in so rigorous a climate, was found barely sufficient to preserve their health.

The ships might be considered almost as effective as when the Expedition left England; the wear and tear having been trifling, and the quantity of stores remaining on board being amply sufficient, in all probability, for a much longer period than the provisions and fuel. The health of the officers and men continued also as good, or nearly so, as at the commencement of the voyage. Considering, however, the serious loss we had sustained in the lemon-juice, the only effectual anti-scorbutic on which we could depend, during at least nine months of the year in these regions, as well as the effects likely to result from crowding nearly one hundred persons into the accommodation intended only for fifty-eight, whereby the difficulty of keeping the inhabited parts of the ships in a dry and wholesome state would have been so much increased, there certainly seemed some reason to apprehend, that a second winter would not leave us in possession of the same excellent health which we now happily enjoyed, while it is possible that the difficulty and danger of either proceeding or returning might have been increased.

These considerations, together with some others of minor importance, induced me, at this time, to call for the opinions of the principal officers of the Expedition, being desirous of profiting by their united judgment and experience, previous to forming my ultimate decision as to the measures most proper to be pursued. I, therefore, addressed a letter to Lieutenants Liddon, Beechey, and Hoppner, Captain Sabine, and Messrs. Edwards and Hooper, respectively, directing their attention to the different points connected with our situation which I have just detailed, and requesting their advice upon the subject within thirty-six hours after the receipt of my letter. 1820. August.

Early in the morning of the 24th, the wind shifted to north, and soon after increased to a fresh breeze, which made the ice stream off the land, but so slowly, that it was not till ten A.M., that we had a channel wide enough to move the ships to a point a mile and a half to the eastward, which we reached by short tacks at noon; and, beyond which, as well as to the south and west, nothing but ice could be seen. So quickly, indeed, was the narrow channel closed, in which we had been sailing, that when we made fast to the ice at the point, it would have been impossible to have returned even to the spot we had just before left. Thur. 24.

A herd of musk-oxen being seen at a little distance from the ships, a party was despatched in pursuit; and Messrs. Fisher and Bushnan were fortunate in killing a fine bull, which separated from the rest of the herd, being too unwieldy to make such good way as the others. He was, however, by no means caught by our people in fair chase, for though these animals run with a hobbling sort of canter that makes them appear as if every now and then about to fall, yet the slowest of them can far outstrip a man. In this herd were two calves, much whiter than the rest, the older ones having only the white saddle. In the evening, Serjeant Martin succeeded in killing another bull; these two animals afforded a very welcome supply of fresh meat, the first giving us three hundred and sixty-nine, and the other three hundred and fifty-two pounds of beef, which was served in the same manner as before.*

* The total quantity of game obtained for the use of the Expedition, during our stay upon the shores of Melville Island, being a period of nearly twelve months, was as follows:

3	Musk-oxen	Affording 3,766 pounds of meat.
24	Deer	
68	Hares	
53	Geese	
59	Ducks	
144	Ptarmigans	

1820. August. The wind died away soon after we reached the point, affording no hope of making, for the present, any further progress by the drifting of the ice from the land; we, therefore, hauled the ships into the best births we could find, in doing which the Hecla's fore-foot rested on the ground for a short time, but she was afterwards secured in four fathoms. It was low water by the shore at eight P.M.

Frid. 25. The ice closed in upon us in the course of the night, leaving not a single pool of open water in sight in any direction. It was high-water at half-past two A.M., and low-water at three-quarters past eight, so that the tides appeared to continue very regular on this part of the coast. The Griper, being very near the beach, grounded as the tide fell, so that the water left her between two and three feet; Lieutenant Liddon, therefore, warped out nearer to the Hecla in the afternoon, for fear of not getting off when it might be necessary.

Immediately under the hills, which here, for the first time, in sailing from Cape Providence to the eastward, recede about two miles from the sea, was the most luxuriant pasture-ground we had yet met with on Melville Island. It consisted of about a dozen acres of short thick grass, intermixed with moss, which gave it almost the same lively appearance as that of an English meadow. It was covered with the dung and foot-tracks of musk-oxen, of which twelve or fourteen skulls were picked up near it; and it was here that the herd before-mentioned was feeding. When walking over this spot, on which there were many small ponds of water, our surprise in some degree ceased at the immense distance which these animals must travel in the course of their annual visits to these dreary and desolate regions; as such a pasture affording undisturbed and luxuriant feeding during the summer months, may, in spite of the general dreary appearance of the island, hold out sufficient inducement for their annual emigration.

A thermometer in the sun about two P.M. stood at 52° for a short time, the weather being quite calm and fine. Mr. Fisher tried an experiment on the specific gravity of a piece of floe-ice found lying on the top of one of the grounded masses near the beach. Being formed into a cube, whose sides measured two feet, and put into the sea, at the temperature of 33°, with that side up which was lying uppermost when first found, three inches and a half of it remained above the surface; but when the opposite side was turned up, only three inches appeared above water. The latitude observed at this station was 74° 27′ 19″, the longitude 112° 11′ 32″, and the variation of the magnetic needle 114° 34′ 45″ Easterly.

We here obtained our last supply of sorrel, the leaves of which had now become so shrivelled, as well as insipid, as to be no longer worth gathering. We saw no birds here but one or two flocks of king-ducks, a speckled owl, which was killed, and now and then a solitary glaucous gull. 1820. August.

An air of wind having sprung up from the westward in the evening, the ice had slackened about us a little by eight P.M., which induced me to cast off soon after, though with little prospect of making any progress. After two hours, during which the breeze deserted us, we had gained about three-quarters of a mile to the eastward, and then made fast to the land-ice to wait for an opening, which might enable us to proceed.

The wind remained light and variable till five A.M. on the 26th, when a westerly breeze began to open the ice a little; at seven we cast off, and made all sail to the eastward, through loose but heavy pieces of ice, between which there seemed sufficient room for the ships to sail. We soon found, however, that the young ice, which at a distance appeared like open water, had so completely occupied the space between the heavier masses, that when the ship had entered it, it was impossible to keep way upon her, or to get her head in the right direction. Such, indeed, was the difficulty of doing this, that we were incessantly labouring from eight till half-past eleven, without gaining a single yard, except what the ship drifted with the ice. Having at length, however, got out of the scrape into which the young ice had unavoidably brought us, and the breeze freshening up strong from the westward, all sail was made along the land, generally within half a mile of the beach, where a channel of clear water had now opened. In the course of the morning, the Hecla received some very severe shocks, one of which we were apprehensive had damaged the rudder, the ship having run with fresh sternway against a heavy piece of ice, but fortunately no material injury was sustained. Sat. 26.

Soon after noon, the weather became thick, with heavy snow, so that we were obliged to run entirely by the lead, on which we had every reason confidently to rely, as a safe and sure guide. We kept close along the edge of the ice, which was quite compact to the southward of us, without the smallest appearance of an opening to encourage a hope of penetrating in that direction.

Having now received the answers of the officers to my letter addressed to them on the 23d, and given the matter my most serious and mature consideration, it was necessary that I should make up my mind as to the future conduct of the Expedition. It was gratifying to me to find that the officers

1820. August. unanimously agreed with me in opinion that any further attempt to penetrate to the westward in our present parallel would be altogether fruitless, and attended with a considerable loss of time, which might be more usefully employed. They also agreed with me in thinking, that the plan which I had adopted, of running back along the edge of the ice to the eastward, in order to look out for an opening that might lead us towards the American continent, was, in every respect, the most advisable; and that, in the event of failing to find any such opening, after a reasonable time spent in the search, it would be expedient to return to England rather than to risk the passing another winter in these seas, without the prospect of attaining any adequate object; namely, that of being able to start from an advanced station at the commencement of the following season.

Under all the circumstances of the case, therefore, I could not but admit the propriety of immediately returning to England, should our attempt to penetrate to the southward prove unsuccessful in any part of the navigation between the position we now occupied and Barrow's Strait; as it would, in that case, be impossible to make so much progress either to the southward or the westward during the short remainder of the present season, as to bring the accomplishment of the passage through Behring's Strait within the scope of our remaining resources.

At three P.M. we were abreast of Cape Hearne; and, as we opened the bay of the Hecla and Griper, the wind, as usual on this part of the coast, came directly out from the northward; but as soon as we had stretched over to Bounty Cape, of which we were abreast at eight P.M., it drew once more along the land from the westward. We found a large quantity of loose and broken ice off Cape Hearne, and not far from the same place we came to a floe of young ice, of nearly a mile in length, and about two inches and a half in thickness, which had undoubtedly been formed this summer, probably in some of the bays and inlets in the neighbourhood of Bounty Cape. The distance between the ice and the land increased as we proceeded, and at midnight the channel appeared to be four or five miles wide, as far as the darkness of the night would allow of our judging; for we could at this period scarcely see to read in the cabin at ten o'clock. The snow which fell during the day was observed, for the first time, to remain upon the land without dissolving; thus affording a proof of the temperature of the earth's surface having again fallen below that of freezing; and giving notice of the near approach of another long and dreary winter. One or two fulmar petrels, some tern,

and numerous flocks of snow-buntings, were seen about the ships in the course of the day. 1820. August.

The navigable channel increased so much in breadth, as we ran to the eastward with a fresh and favourable breeze, that at eight A.M., on the morning of the 27th, when we had advanced beyond the east end of Melville Island, it was not less than ten miles wide. We kept near the ice, running at such a distance from it as not to get the ships embayed between the points, which often occasions a long and useless delay in afterwards beating round them with a scant wind. A constant look-out was kept from the crow's-nest for an opening to the southward, but not a single break could be perceived in the mass of ice which still covered the sea in that direction. We were at noon in latitude 75° 02′ 15″, and longitude 105° 14′ 20″, the soundings being ninety-four fathoms, on a muddy bottom. Some water brought up from that depth in Dr. Marcet's bottle was at the temperature of 31°$\frac{3}{4}$, that at the surface being 30°, and of the air 31°. Sun. 27.

At seven P.M., a fog coming on, we hauled up close to the edge of the ice, both as a guide to us in sailing during the continuance of the thick weather, and to avoid passing any opening that might occur in it to the southward. We were, in the course of the evening, within four or five miles of the same spot where we had been on the same day, and at the same hour the preceding year; and by a coincidence perhaps still more remarkable, we were here once more reduced to the same necessity as before, of steering the ships by one another for an hour or two; the Griper keeping the Hecla ahead, and our quarter-master being directed to keep the Griper right astern, for want of some better mode of knowing in what direction we were running. The fog froze hard as it fell upon the rigging, making it difficult to handle the ropes in working the ship, and the night was rather dark for three or four hours.

A fresh breeze continued from the S.W.b.W., with some swell, to which we had long been unaccustomed, and which, together with the extreme thickness of the weather, and the uncertainty of our course, made great caution necessary in running along the ice. We had for some time been steering principally by the moon, but when she became obscured, we were under the necessity of hauling our wind to the northward and westward, which led us from the ice, till the weather should become more favourable. The fog began to clear away at half-past five A.M. on the 28th, and immediately after we saw land from N.E.b.E. to N.N.W. The ships' heads were now put to the S.S.E., in order to take up the ice where we had last seen it, Mon. 28.

1820. August. but at six o'clock, in approaching some heavy detached masses, which appeared to be aground, and therefore made us very cautious with the hand-leads, we shoaled the water rather more suddenly than usual from thirty-five to ten, and then to seven, fathoms, and tacked in five and three quarters at the distance of half a mile to the westward of the grounded ice. There is certainly no land within two or three leagues of this shoal, on which, however, I have little doubt, from the appearance of the ice aground upon it, there is water enough for any ship, and which will probably be at all times clearly pointed out by the never-failing beacons of these seas. It is customary to judge by the tide-mark upon the ice whether it be aground or not, and by its dimensions whether it may be boldly approached.

Having hauled to the N.N.E., and then gradually more to the eastward, we deepened our water till no soundings could be obtained with forty fathoms of line, and then steered again to the S.E., in order to make the main ice. The impossibility of keeping any thing like an accurate reckoning during the last night's run, and the difficulty of recognising the land in consequence of the snow which now almost entirely covered it, left us for some time at a loss to ascertain our position, till we found ourselves at noon off Cape Cockburn, our latitude by observation being 74° 58′ 28″. We were now enabled to determine the continuity of the land from that point to Graham Moore's Bay, which, on its first discovery, we could not exactly ascertain on account of the distance at which we sailed from it.

The ice to the southward, along which we continued to sail this day, was composed of floes remarkable for their extraordinary length and continuity, some of them not having a single break or crack for miles together; though their height above the sea was not generally more than twelve inches, and their surface as smooth and even as a bowling-green, forming, in both these respects, a striking contrast to the ice to which we had lately been accustomed more westerly. The outer edge of these floes, however, for about one hundred yards, was broken by the sea into innumerable small pieces, remaining so close that a boat would not penetrate them; a circumstance which I notice because it prevented my putting into execution a plan I had proposed of making some observations on the variation of the magnetic needle in this neighbourhood, there being every reason to suppose that we should have found it to be 180°, or the south point of the needle turned directly to the North Pole of the earth, about the meridian of 100° West of Greenwich. The wind being to the southward of west, which

made this shore a lee one, did not allow me to land on Bathurst Island for this purpose. 1820. August.

The weather was again so thick with snow in the afternoon, that we were once more obliged to sail round all the bays in the ice, instead of running from point to point, in order to leave no part of it unexamined; and, on its clearing up in the evening, we found that the ice was leading us to the northward of Garrett Island, the passage to the southward of it, through which we had sailed to the westward the preceding year, being now completely blocked up by floes, which did not appear to have been detached from the island during this season. We had here occasion to notice, in a very striking degree, the deception occasioned by snow lying upon the land, in judging of its distance; this, indeed, is much more remarkable in these seas than in any other, when any part of the intermediate space is occupied by floes of ice, the whiteness of which mingles so imperceptibly with that of the snow upon the land, that it is impossible, from the total absence of any shadow, to tell where one ends and the other commences. Such, indeed, was the illusion this evening, with respect to Garrett Island, which was completely covered with snow, that, although we were sailing at the distance of only four or five miles from it, we should scarcely have been aware that any land was in that direction, had we not previously surveyed these islands, and been running with the chart before us.

In passing between Garrett and Bathurst Islands, at the distance of five miles from the former, we could find no bottom with thirty-five to fifty fathoms of line; and when its centre bore S.b.W. $\frac{1}{4}$W. at the same distance, another island was discovered to the northward, which had not before been seen, and which I named after my friend and former commander, Captain Thomas Baker, of the Royal Navy. The eastern part of Bathurst Island was now observed to extend farther to the N.N.E. than we had before been enabled to see it, terminating by a point of land, called Cape Capel, out of respect to the Honourable Captain Thomas Bladen Capel, of the Royal Navy.

We continued to run along the edge of the ice to the eastward, till half-past ten P.M., when more land being discovered a-head, of the extent and position of which we had no previous knowledge, and, the night growing dark, the ships were hove-to with their heads to the northward and westward, in which direction there was a space of clear water several miles in extent, being in ninety fathoms, on a bottom of soft mud.

1820. August. Tues. 29. Having again got sight of the land at half-past two A.M., on the 29th, we bore up for it, along the edge of the ice, which completely surrounded Lowther Island, but left us a free passage to the eastward. The land, discovered the preceding evening, proved to be an island, about a mile and a half in length; and being rather high, and remarkably bluff in every view, appeared to have deep water all round it. We were abreast of it at half-past five, and I named it BROWNE ISLAND, out of respect to my much-esteemed friend, MR. HENRY BROWNE, of Portland-Place. The ice then led us in a S.E. $\frac{1}{2}$ E. direction, towards another island, distant from the first three miles and a half, bearing S.S.E. It was named after my friend DR. SOMERVILLE; and is low at both ends like Garrett Island. When we first bore up in the morning, we had indistinctly seen land from N.N.E. to E.N.E., at the distance of four or five leagues. As we advanced, and the day became more clear, we found it to extend much farther to the eastward, and afterwards ascertained that it formed a part of Cornwallis Island, not before seen. At six o'clock we made Griffith Island, between which and the ice we found the navigable channel narrowed in one part to a mile, at which distance from the shore, we could obtain no soundings with forty to fifty fathoms of line. The whole of the shore of Griffith Island seemed to be bold, the land being steep and bluff, especially towards its south-east end, where the strata, which appeared to be of sandstone, were observed to dip at a considerable angle to the S.E.

At half an hour before noon, the weather being alternately thick and clear, from occasional showers of snow, a deeper bight than usual was perceived in the ice, which had hitherto been nearly as compact as if it were composed of a single floe. As I had always entertained an idea, that there was no part of this sea, in which we were more likely to get to the southward, than immediately to the westward, of Cape Bunny, I was desirous of thoroughly examining the state of the ice in this neighbourhood, and bore up to the southward, under all sail for that purpose. After running two or three miles, however, we were again stopped at twenty minutes past noon; and the weather having now cleared up, we perceived that the ice was as compact as before, except that there was one "hole" of water about a third of a mile wide just within its margin, but beyond this it was quite close and impenetrable. We were, therefore, under the necessity of again hauling to the eastward, along the edge of the floes, which lay in a direction nearly parallel to the southern shore, and at the distance of seven or eight miles

from it, being much nearer than we had been able to approach it, only six days earlier the preceding season. It is remarkable that we here found a strong rippling on the surface of the water, in the same place where we had before noticed it; and, as we could discover nothing like shoal-water, or unevenness in the bottom, we concluded it must have been occasioned by some particular set, or meeting of the tides in this place. The space between us and Cornwallis Island was entirely free from ice, and Wellington Channel presented the same broad navigable passage, as on the former occasion. 1820. August.

The continuity or otherwise, of a large portion of the land now to the southward of us having before remained undetermined, on account of the hazy weather we had experienced on our passage to the westward, I was glad to have an opportunity of filling up the deficiencies which had unavoidably been left in the chart, upon this part of the coast. Immediately to the eastward of Cunningham Inlet is a bold headland, which formed the extreme of the land visible in this direction, in 1819, and which now being clearly distinguished, I named after MAJOR RENNELL, a gentleman well known as the ablest geographer of the age. At the back of Cape Rennell, the land recedes considerably, forming a large bay, which I called GARNIER BAY, and which, as we did not distinctly see the bottom of it in one part, may not improbably be found to communicate with Cunningham Inlet, making the intermediate land, on which Cape Rennell stands, an island. Before night came on, we had traced the land to the eastward nearly as far as Cape Clarence; but being desirous of leaving no part of this coast unexamined, by running past it in the night, I hove-to at half-past ten, with the ships' heads to the northward, and found no soundings with a hundred and thirty fathoms of line. The whole of the land we passed this day was much covered with snow, and, perhaps, permanently so, as the mean temperature of the atmosphere had, for some time past, fallen rather below the freezing point. If this conclusion be just, it would appear that the present season was about to close-in somewhat earlier than it had done the preceding year. A flock of brent-geese, some fulmar petrels, a dovekey, and one or two ivory gulls, were all the birds seen in the course of this day's run.

To the land along which we had now been sailing, I gave the name of NORTH SOMERSET, in honour of my native county; and the northern shore of Barrow's Strait was called NORTH DEVON, after that of Lieutenant Liddon.

At a quarter past three on the morning of the 30th, we bore up to the Wed. 30.

1820. August. eastward, the wind continuing fresh directly down Barrow's Strait, except just after passing Prince Leopold's Islands, where it drew into Prince Regent's Inlet, and as soon as we had passed this, again assumed its former westerly direction; affording a remarkable instance of the manner in which the wind is acted upon by the particular position of the land, even at a considerable distance from it. The islands were incumbered with ice to the distance of four or five miles all round them, but the Strait was generally as clear and navigable as any part of the Atlantic.

Having now traced the ice the whole way from the longitude of 114° to that of 90° without discovering any opening to encourage a hope of penetrating it to the southward, I could not entertain the slightest doubt, that there no longer remained a possibility of effecting our object with the present resources of the Expedition; and that it was, therefore, my duty to return to England with the account of our late proceedings, that no time might be lost in following up the success with which we had been favoured, should His Majesty's Government consider it expedient to do so. Having informed the officers and men in both ships of my intentions, I directed the full allowance of provisions to be, in future, issued, with such a proportion of fuel as might contribute to their comfort; a luxury which, on account of the necessity that existed for the strictest economy in this article, it must be confessed, we had not often enjoyed since we entered Sir James Lancaster's Sound. We had been on two-thirds allowance of bread between ten and eleven months, and on the same reduced proportion of the other species of provisions, between three and four; and, although this quantity is scarcely enough for working men for any length of time, I believe the reduction of fuel was generally considered by far the greater privation of the two.

We ran along the south shore, at the distance of four or five leagues, with a fresh westerly wind, and fine clear weather; a bay on that coast, a little to the westward of Cape York, was named after my friend, The Honourable Mr. Eardley. We noticed a striking similarity in the geological character of this part of the coast, as far as we could judge at a distance, to that on the opposite shore of Barrow's Strait, both being remarkable for that buttress-like structure, which has before been observed to resemble the works of art, and which gives this land a magnificent and imposing appearance such as it is impossible to describe. The shores were covered with ice to the distance of four or five miles, and the first solitary iceberg was seen in the course of the afternoon; but the Strait was, in other respects, perfectly

free from obstruction. At eleven P.M., we were abreast of a bluff and remarkable headland, which I named after my much esteemed friend, Mr. William Petrie Crauford, and to the eastward of which the land appeared to recede, forming a large bay. I continued to run during the night, however, being desirous of taking advantage of the westerly breeze which was still blowing, to run out of Sir James Lancaster's Sound.

It was not light enough till half past three on the morning of the 31st to enable us to perceive that the land immediately to the eastward of Cape Crauford was not continuous, there being a space subtending an angle of 21° 42′ in the middle of the supposed bay, where none was visible, though the weather was perfectly clear. As the wind drew almost directly out of this opening, to which I gave the name of Admiralty Inlet, and, as it was entirely occupied by ice, I did not think its further examination of sufficient importance to detain the Expedition, and therefore continued our course to the eastward. The headland, which forms the eastern point of the entrance, I named after The Right Honourable Charles Yorke, late First Lord of the Admiralty; and to another within the inlet, I gave the name of Cape Franklin, after my friend, Captain John Franklin, of the Royal Navy, now employed in investigating the northern shore of North America. On an inspection of the chart, it will appear more than probable, that the Admiralty Inlet may one day be found to communicate to the southward with Prince Regent's Inlet, making the land between them an island.

At half past eight A.M., we were abreast of the Navy Board Inlet, round the bottom of which the continuity of the land was still by no means clear to us; in fact, it receded so far to the southward, as rather to strengthen the opinion we had before formed of the existence of a passage in that direction; the quantity of ice which occupied this inlet, however, prevented our ascertaining this satisfactorily. Immediately off Cape Castlereagh, we discovered two low islands, which had not been seen on the preceding voyage, and which I named after Dr. William Wollaston, a gentleman well known in the scientific world, and one of the Commissioners of Longitude. To the eastward of the Cape, there is some comparatively low land next the sea, from which abruptly rise the lofty Byam Martin Mountains, whose summits are covered with perpetual snow. One of the highest of these, immediately at the back of Catherine's Bay, of which we were abreast at noon, was found trigonometrically to be three thousand three hundred and eighty-two feet above the level

1820. August. of the sea. It may be remarked that the castellated appearance of the land is very much less on the eastern than on the western side of Admiralty Inlet. Towards the west side of Navy-Board Inlet, the land next the sea becomes comparatively low, but rises at the back into high hills, which are round at the top; in this respect forming a striking contrast with the Martin Mountains, the latter being peaked, though not so sharply as those of Spitzbergen.

Our horizon being obstructed at noon by the closeness of the land, I was desirous of going on shore to observe the meridian altitude; but, on hauling the ships to the wind with that intention, I found the beach so lined with ice for about half a mile out, that it was no where practicable to land, and the ice itself was too unsteady for the artificial horizons; we, therefore, continued to run to the eastward. A large bear was seen swimming, and our boats despatched in pursuit of him; but before the ship could be rounded to, we had run too far to keep sight of him, and the boats returned without success. We here passed several large icebergs, and a few narrow streams of ice, of the same thickness as that which usually occurs in Baffin's Bay, and which appeared very light to us, in comparison with that to which we had lately been accustomed. Being off Cape Liverpool, which headland is formed by a projecting point of the same comparatively low land that I have mentioned above, the water became of a very light-green colour, and was filled with innumerable shoals of the *Argonauta Arctica;* we found no bottom with eighty fathoms of line, at the distance of two or three miles from the shore. In the course of this day's run we saw two threshers, one black whale, a seal, some dovekeys, ivory-gulls, phalaropes, and fulmar-petrels. Considering the extraordinary number of whales we had met with in our passage up Sir James Lancaster's Sound in 1819, it could not but be a matter of surprise to us that we had now seen so few; but this circumstance was afterwards satisfactorily accounted for in a manner we least expected. In the evening, being off Cape Fanshawe, we observed a long low iceberg, between that headland and Possession Bay, not less than three-quarters of a mile in length, and quite flat and even at the top; this kind of iceberg appears to be almost entirely confined to the western coast of Baffin's Bay and Davis' Strait, as we never met with them in any other part; they are probably formed upon the low strips of land which occur between the foot of the hills and the sea in many parts of this coast.

As it appeared to me that considerable service might be rendered by a general survey of the western coast of Baffin's Bay, which, from Sir James

Lancaster's Sound southwards, might one day become an important station for our whalers, I determined to keep as close to that shore, during our passage down, as the ice and the wind would permit; and as the experience of the former voyage had led us to suppose that this coast would be almost clear of ice during the whole of September, I thought that this month could not be better employed than in the examination of its numerous bays and inlets. Such an examination appeared to me the more desirable, from the hope of finding some new outlet into the Polar Sea in a lower latitude than that of Sir James Lancaster's Sound, a discovery which would be of infinite importance towards the accomplishment of the North-West Passage. 1820. August.

Previously to commencing this survey, it was my wish to have landed at Possession Bay, of which the longitude had been accurately determined on two former occasions, in order to compare our chronometers with the time found there, as an intermediate station between Winter Harbour and England; but, as this would have detained us a whole night, with a fair wind, and with the chance of the following day being after all unfavourable for observations, I gave up my intention, and made all sail along shore to the southward. This was, however, the less to be regretted, as the few observations obtained during our quick return from Melville Island, had confirmed the accuracy of the rates assigned to the chronometers on leaving Winter Harbour.

Annexed is an abstract of the Meteorological Observations made on board the ships during the twelve calendar months that the Expedition remained between the parallels of 74° and 75° north latitude.

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, for Twelve Calendar Months; during which period, she was between the parallels of 74° and 75° North Latitude.

Months.		Temperature of Air in Shade.				Barometer.			REMARKS.
		Maximum.	Minimum.	Range.	Mean.	Maximum.	Minimum.	Mean.	
		°	°	°	°	inches.	inches.	inches.	
1819.	September	+37	−1	38	+22.54	30.42	29.36	29.905	The thermometer when placed on shore, or on the ice at a distance from the ship, invariably stood from 3° to 4° or 5°, and even, on some occasions, 7° lower than that registered on board: the mean temperature for the year may therefore be fairly considered as −2°. The lowest temperature, registered on the ice, was −55°; it did not rise above −54°, for seventeen hours, on the 14th and 15th of February, 1820.
	October	+17.5	−28	45.5	−3.46	30.32	29.10	29.81	
	November	+6	−47	53	−20.60	30.32	29.63	29.945	
	December	+6	−43	49	−21.79	30.755	29.10	29.865	
1820.	January	−2	−47	45	−30.09	30.77	29.59	30.078	
	February	−17	−50	33	−32.19	30.15	29.32	29.769	
	March	+6	−40	46	−18.10	30.26	29.00	29.803	
	April	+32	−32	64	−8.37	30.86	29.40	29.978	
	May	+47	−4	51	+16.66	30.48	29.25	30.109	
	June	+51	+28	23	+36.24	30.13	29.50	29.823	
	July	+60	+32	28	+42.41	30.01	29.13	29.668	
	August	+45	+22	23	+32.68	30.03	29.46	29.734	
		+60	−50	110	+1.33	30.86	29.00	29.874	

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, at Sea, during the Month of *August*, 1820.

Day	Temperature of Air in shade.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Maximum.	Minimum.	Mean.		
	+ °	+ °	+ °	inches.	inches.	inches.		
1	42	+32	36.21	29.83	29.69	29.767	W.N.W.	Fresh breezes and cloudy weather.
2	38	32	34.17	29.84	29.70	29.793	S.S.W.	Light breezes and cloudy, snow at times.
3	39	33	35.92	29.70	29.57	29.647	Round the compass.	Light breezes, thick hazy weather.
4	38.5	33	35.62	29.69	29.65	29.673	N.W.b.W.	Fresh breezes and fine.
5	41	30.5	34.08	29.79	29.69	29.737	W.b.N.	Light airs and cloudy.
6	36	33	33.96	29.76	29.59	29.672	E.S.E.	Fresh breezes and hazy, sleet and snow.
7	38	31	34.92	29.62	29.56	29.595	Round the compass.	Fresh breezes and fine, occasional squalls.
8	39	33	36.46	29.61	29.60	29.618	Ditto.	Light variable airs, cloudy with rain.
9	40	31	34.79	29.60	29.46	29.513	West.	Light variable airs—hazy.
10	34	30	31.96	29.60	29.54	29.575	W.b.N.	Moderate and hazy, small snow.
11	33	30	31.29	29.64	29.53	29.592	E.S.E.	Light breezes and foggy, snow at times.
12	38	30.5	34.29	29.70	29.48	29.542	E.N.E.	Strong breezes and squally weather.
13	45	31	36.92	29.87	29.76	29.828	Round the compass.	Light breezes and cloudy.
14	28	27	33.22	29.81	29.71	29.762	West.	Light airs and hazy.
15	37	29	32.33	29.85	29.76	29.805	W.N.W.	Moderate and hazy, with snow.
16	34	29	32.42	30.01	29.83	29.948	W.N.W.	Moderate and fine.
17	36	28	31.83	30.03	29.96	30.007	W.S.W.	Light airs, and fine clear weather.
18	36	30	33.08	29.90	29.79	29.843	Calm.	Cloudy.
19	40	28	33.96	29.87	29.79	29.820	West.	Light breezes and cloudy.
20	36	27	31.67	29.91	29.85	29.888	West.	Light breezes, foggy, and cloudy.
21	37	26	30.92	29.84	29.69	29.757	A.M. Calm. P.M. East.	Light breezes and foggy, with snow.
22	37.5	29	31.79	29.69	29.64	29.667	West.	Light airs and hazy, snow.
23	35	30	31.58	29.79	29.71	29.745	West.	Moderate and cloudy.
24	34	30	31.79	29.83	29.71	29.793	North.	Light airs and cloudy.
25	38	27	32.29	29.85	29.83	29.842	Round the compass.	Ditto ditto.
26	34	25.5	28.92	29.81	29.63	29.737	N.N.W.	Fresh breezes and cloudy.
27	31	22.5	27.83	29.92	29.72	29.848	A.M. North. P.M. West.	Light breezes and cloudy.
28	31	22	28.12	29.86	29.72	29.763	W.S.W.	Fresh breezes and hazy.
29	30	28	29.00	29.66	29.61	29.645	N.W.b.W.	Moderate and hazy.
30	33	28	30.00	30.00	29.62	29.638	N.W.	Moderate and cloudy weather.
31	34	29	31.75	29.75	29.63	29.678	W.S.W.	Fresh breezes and cloudy weather.
	+45	+22	+ 32.68	30.03	29.46	29.734		

ASIATIC SOCIETY MUMBAI

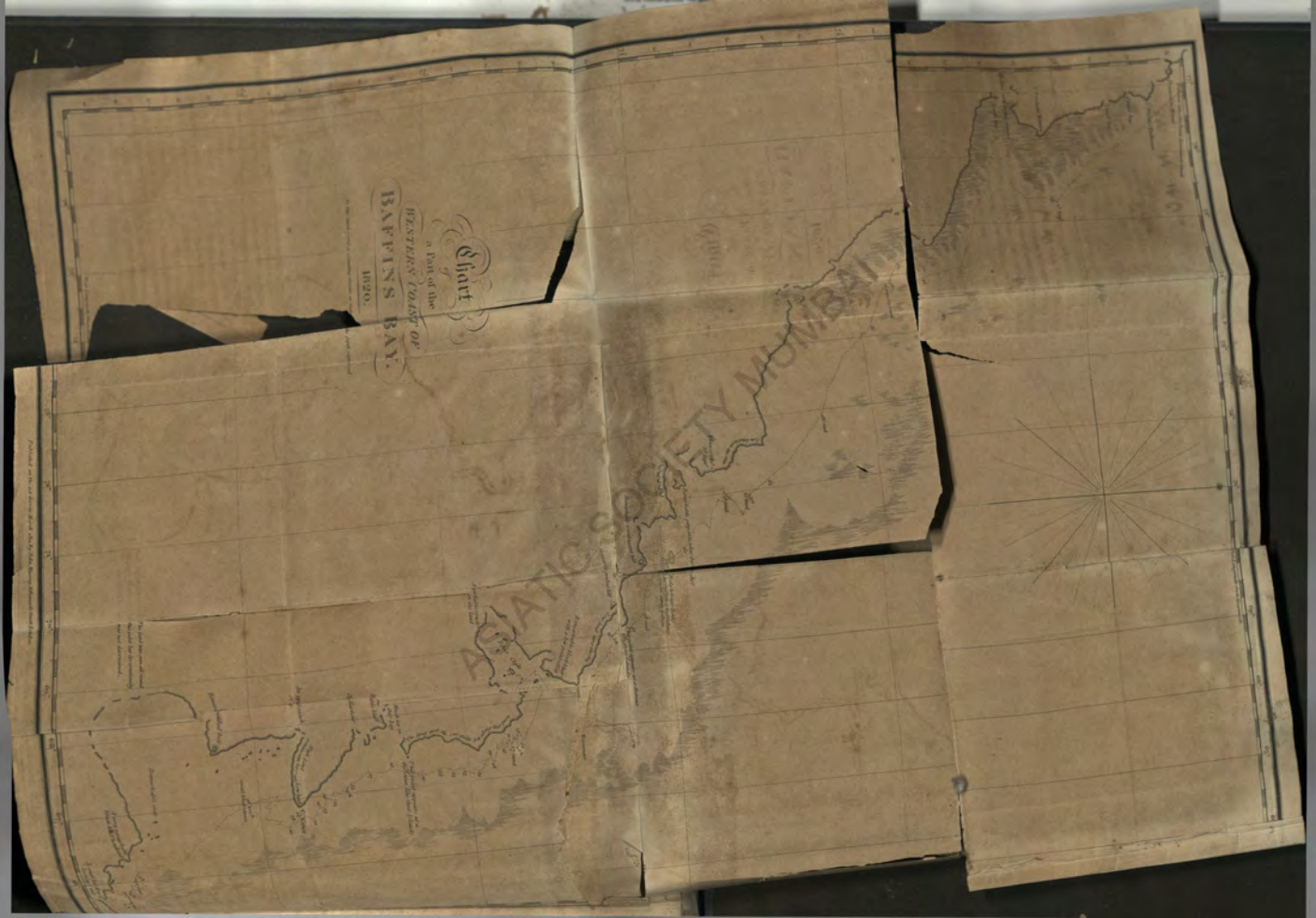
ASIATIC SOCIETY MUMBAI
Published as the act directs March 1821 by John Murray Albemarle Street London.

CHAPTER XI.

PROGRESS DOWN THE WESTERN COAST OF BAFFIN'S BAY—MEET WITH THE WHALERS—ACCOUNT OF SOME ESQUIMAUX IN THE INLET CALLED THE *RIVER CLYDE*—CONTINUE THE SURVEY OF THE COAST, TILL STOPPED BY ICE IN THE LATITUDE OF 68¼°—OBLIGED TO RUN TO THE EASTWARD—FRUITLESS ATTEMPTS TO REGAIN THE LAND, AND FINAL DEPARTURE FROM THE ICE—REMARKS UPON THE PROBABLE EXISTENCE AND PRACTICABILITY OF A NORTH-WEST PASSAGE, AND UPON THE WHALE-FISHERY—BOISTEROUS WEATHER IN CROSSING THE ATLANTIC—LOSS OF THE HECLA'S BOWSPRIT AND FOREMAST—ARRIVAL IN ENGLAND.

THE wind continuing fresh from the northward, on the morning of the 1st of September, we bore up and ran along the land, taking our departure from the flag-staff in Possession Bay, bearing W.S.W. five miles, at half-past four A.M. Having passed two small bays in the course of the morning, we were abreast of Cape Graham Moore towards noon, where the ice led us off to the distance of six or seven miles from the land. Some water brought up in Dr. Marcet's bottle from the depth of one hundred and ten fathoms was at the temperature of 30¼°, that of the surface being 30½°, and of the air 31°. The specific gravity of the surface-water at noon was 1.0246, at the temperature of 49°. 1820. Sept.

When abreast of the inlet, which had been called Pond's Bay on the former expedition, the opening of the two shores, as far as the eye could reach, appeared so large as to excite considerable interest. We, therefore, hauled in with the intention of examining it, but found the ice so close, that the ship was stopped almost in the entrance. The weather, however, was at this time remarkably clear, and it was the opinion of the officers, as well as my own, that the two shores did not unite, there being nearly a whole point of the compass in which no land was visible; and it was the general belief that this opening would be found to communicate with the Navy-Board or Admiralty Inlet.



ASIATIC SOCIETY MUMBAI

1820. Sept. The ice led us off very much to the eastward after leaving Pond's Bay; and the weather became calm, with small snow, towards midnight. In this day's run, the compass-courses were occasionally inserted in the log-book, being the first time that the magnetic needle had been made use of on board the Hecla, for the purposes of navigation, for more than twelvemonths. A few rotges *(Alca Alle)* were seen, being the first this season.

Sat. 2. There being some swell upon the ice, which extended generally to the distance of three or four leagues from the land, we were under the necessity of heaving-to for a few hours at night, a precaution which was always hence-forward adopted in running down this coast. At nine A.M., we were abreast an inlet having every appearance of a well-sheltered harbour, with an island near the middle of its entrance. Soon after passing this inlet, we came to a number of icebergs aground in forty-five fathoms, on a sandy bottom, afterwards deepening to seventy-eight fathoms; a tide-mark of four or five feet was observed upon each of the icebergs. Some water brought up in Dr. Marcet's bottle from the depth of seventy-five fathoms, was at the temperature of $32°\frac{1}{4}$, that of the surface being 32°, and of the air 33°. We again commenced throwing bottles overboard, containing papers with the usual information, which practice was continued daily till the Expedition reached England. We saw no ice to the eastward of us in the course of this day's run, nor any blink in that direction.

Sund. 3. On the morning of the 3d, we passed some of the highest icebergs I have ever seen, one of them being not less than one hundred and fifty to two hundred feet above the sea, judging from the height of the Griper's masts, when near it. At half-past seven A.M., being off a point of land, which is comparatively low near the sea, with hills rising at the back to the height of more than a thousand feet above the sea, we observed to the southward a remarkable dark perpendicular cliff, forming the most singular and conspicuous object we had seen upon this coast. This cliff, which, in coming from the northward has the appearance of being detached, and is not unlike the Bass Rock in the Frith of Forth, is situated, as we afterwards discovered, upon an island, lying in the entrance of one of the numerous inlets, or *fiords*, with which this coast is indented. The wind becoming light and variable in the forenoon, I took the opportunity of landing near this inlet, accompanied by Captain Sabine, and some of the officers. The latitude observed on board at noon was 71° 24′ 20″, being only two miles and three quarters to the southward of the dead reckoning in three days, by which we considered that there

could be no current of any importance setting in that direction on this part of the coast. The soundings were eighty-eight fathoms on a muddy bottom; the temperature of the sea at that depth was 33°, at the surface 35°½, that of the atmosphere being 38°. 1820. Sept.

We landed on a bold sandy beach, two or three miles to the northward of a low point, at the entrance of the inlet, towards which we walked, and ascended a hill at the back of the point, in order to obtain a view of this large opening. We now found that the perpendicular cliff formed the north-eastern point of a remarkably steep and precipitous island, on each side of which there is a wide and bold entrance. Above the island, the inlet branches off in at least two different directions, which our situation would not allow us to trace to any great distance, but we saw no termination to either of them.

The mineral productions were found to consist principally of granite and gneiss; but there was also abundance of limestone and quartz, the latter beautifully white, which, together with the other specimens obtained here, will be described in the proper place in the Appendix. The vegetation was tolerably luxuriant in some places upon the low land which borders the sea, consisting principally of the dwarf-willow, sorrel, saxifrage, (*Saxifraga Cernua*), and poppy, with a few roots of scurvy-grass. There was still a great deal of snow remaining even on the lower parts of the land, on which were numerous ponds of water; on one of these, a pair of young red-throated divers which could not rise, were killed; and two flocks of geese, one of them consisting of not less than sixty or seventy, were seen by Mr. Hooper, who described them as being very tame, running along the beach before our people, without rising, for a considerable distance. Some glaucous gulls and plovers were killed, and we met with several tracks of bears, deer, wolves, foxes, and mice. The coxswain of the boat found upon the beach part of the bone of a whale, which had been cut at one end by a sharp instrument, like an axe, with a quantity of chips lying about it, affording undoubted proof of this part of the coast having been visited at no distant period by Esquimaux; it is more than probable, indeed, that they may inhabit the shores of this inlet, which time would not now permit us to examine. More than sixty ice-bergs of very large dimensions were in sight from the top of the hill, together with a number of extensive floes to the north-east and south-east, at the distance of four or five leagues from the land.

The latitude of the place of observation on shore was 71° 15′ 34″, its

1820. Sept. longitude 71° 17′ 23″.6, and the variation of the magnetic needle 91° 28′ 32″ Westerly. The tide was falling when we landed; it was low water by the shore at three o'clock, and at half-past five, when we left the beach, it had risen only twelve inches. The tide set to the southward in the offing during the afternoon, especially about three o'clock, at which time the Hecla was observed by Lieutenant Beechey to be drifting fast against the wind in that direction.

On our return on board, I found that a piece of whale-blubber, cut into a square shape, had been picked up on the water, which we then considered as a confirmation of this part of the coast being inhabited, but which was afterwards more satisfactorily accounted for.

Mon. 4. The wind, which had been light from the southward during the night, shifted to the north-west early in the morning, which induced me to give up the intention I had formed of further examining the inlet, and we, therefore, continued our course along shore to the southward. At seven A.M., we passed another inlet, similar to that of the preceding day, though much smaller, the land being of the same steep and precipitous character, and the water, apparently, deep near it.

The latitude observed was 71° 02′ 42″, agreeing within a mile of the account, so that no current could well have existed since the preceding day's observation. In sounding as usual, at noon, we were not a little surprised in striking bottom in thirteen fathoms, the appearance of the shore, from which we were three or four leagues distant, indicating very deep water. A boat was sent a-head to sound, the wind having again broke us off from the southward; at two o'clock we suddenly deepened the water to thirty-five, and soon after to fifty-six fathoms. At four P.M., we again dropped into fifteen fathoms, and the boats a-head found as little as eleven, on which several masses of ice were aground, pointing out, as usual, the extent of the shoal water. These two banks, which consist of coarse sand with broken shells, were named after the Hecla and Griper; they form a striking exception to the general rule of judging of the boldness of a coast by the appearance of the shores.

While occupied in attending to the soundings, soon after noon, our astonishment may readily be conceived, on seeing, from the mast-head, a ship, and soon after, two others, in the offing, which were soon ascertained to be whalers, standing in towards the land. They afterwards bore up to the northward along the edge of the ice which intervened betwixt us, and we lost sight of them at night. It was now evident that this coast, which had hitherto been considered, by the whalers, as wholly inaccessible in so high

a latitude, had become a fishing station like that on the opposite or Green- 1820. Sept.
land shore; and the circumstance of our meeting so few whales in Sir James Lancaster's Sound this season, was at once accounted for by supposing what, indeed, we afterwards found to be the case, that the fishing-ships had been there before us, and had, for a time, scared them from that ground. The piece of blubber we had picked up was also sufficiently accounted for in a similar manner.

In standing in-shore at night, we got into deep water, between the banks and the land, having no soundings with sixty to ninety fathoms of line, where we lay-to till day-light.

It was so squally on the morning of the 5th, that we could scarcely carry Tues. 5.
our double-reefed topsails, while, as we afterwards learned from the fishing-ships, which were in sight at day-light, there was scarcely a breath of wind at a few leagues' distance from the land. In running to the southward, we passed, in the course of the forenoon, a headland, which is remarkable as appearing from the northward exactly like three round-topped islands, for which they had been taken on the voyage of 1818; but they are only small hills situated on comparatively low land, which commences from hence to the southward next the sea. We coasted this low shore, as we had done in the preceding voyage, at the distance of two or three miles, having from twenty-three to twenty-nine fathoms' water. We here met with another of our fishing-ships, which proved to be the Lee, of Hull, Mr. Williamson master; from whom we learned, among other events of a public nature which were altogether new to us, the public calamity which England had sustained in the death of our late venerable and beloved Sovereign, and also the death of His Royal Highness the Duke of Kent. Mr. Williamson, among others, had succeeded in getting across the ice to this coast as high as the latitude of 73°, and had come down to this part in pursuit of the fish. One or two of the ships had endeavoured to return home by running down this coast, but had found the ice so close about the latitude of $69\frac{1}{2}°$, as to induce most of the others to sail to the northward, in order to get back in the same way that they came. Mr. Williamson also reported his having, a day or two before, met with some Esquimaux in the inlet named the River Clyde in 1818, which was just to the southward of us. Considering it a matter of some interest to communicate with these people, who had, probably, not been before visited by Europeans, and that it might, at the same time, be useful to examine the inlet, I bore up, as soon as I

1820. Sept. had sent our despatches and letters on board the Lee, and stood in towards the rocky islet called Agnes' Monument, passing between it and the low point which forms the entrance to the inlet on the northern side. This channel, which is two miles wide, appears bold in every part. As soon as we had opened the inlet, we dropped off at once from twenty into no bottom with thirty fathoms of line; we then hauled over to the Monument, and, passing at the distance of one hundred and fifty yards from it, had twenty-seven fathoms, on a bottom of coarse sand.

The north shore of the entrance to this inlet has a sandy beach, along which we stood for three or four miles towards some low islands, near which we were directed to look for the Esquimaux huts. Night came on, however, before we could discover them; and we, therefore, stood out till day-light. We saw, in the course of this day, more than a dozen large black whales, principally near the inlet, and the Friendship, of Hull, Mr. Macbride master, was in sight to the eastward, with a fish alongside.

The weather was too thick, with snow, on the morning of the 6th, to allow us to stand in for the land. We spoke the Friendship, and Mr. Bell, one of the owners, kindly offered us any assistance in his power. The weather having cleared before noon, we bore up for the inlet, being near an immense iceberg, which, from its situation and dimensions, we recognised to be the same that had been measured in September, 1818, and found to be upwards of two miles in length. It was aground in precisely the same spot as before, where it will probably remain year after year, till gradually wasted by dissolution.

At six in the evening, being near the outermost of the islands, with which we afterwards found this inlet to be studded, we observed four canoes paddling towards the ship; they approached with great confidence, and came alongside without the least appearance of fear or suspicion. While paddling towards us, and indeed before we could plainly perceive their canoes, they continued to vociferate loudly; but nothing like a song, nor even any articulate sound, which can be expressed by words, could be distinguished. Their canoes were taken on board by their own desire, plainly intimated by signs, and with their assistance, and they at once came up the side without hesitation. These people consisted of an old man, apparently much above sixty, and three younger, from nineteen to thirty years of age. As soon as they came on deck, their vociferations seemed to increase with their astonishment, and, I may add, their pleasure; for the reception they

met with seemed to create no less joy than surprise. Whenever they received a present, or were shewn any thing which excited fresh admiration, they expressed their delight by loud and repeated ejaculations, which they sometimes continued till they were quite hoarse, and out of breath, with the exertion. This noisy mode of expressing their satisfaction was accompanied by a jumping which continued for a minute or more, according to the degree of the passion which excited it, and the bodily powers of the person who exercised it, the old man being rather too infirm, but still doing his utmost, to go through the performance. 1820. Sept.

After some time passed on deck, during which a few skins and ivory knives were bought from them, they were taken down into the cabin. The younger ones received the proposal to descend somewhat reluctantly, till they saw that their old companion was willing to shew them the example, and they then followed without fear. We had soon occasion to remark that they were much better behaved people than the Esquimaux who had visited our ships in 1818, on the north-eastern coast of Baffin's Bay. Although we were much at a loss for an interpreter, we had no great difficulty in making the old man understand, by shewing him an engraved portrait of an Esquimaux, that Lieutenant Beechey was desirous of making a similar drawing of him. He was accordingly placed on a stool near the fire, and sat for more than an hour with very tolerable composure and steadiness, considering that a barter for their clothes, spears, and whalebone, was going on at the same time near him. He was, indeed, kept quiet by the presents which were given him from time to time; and when this failed, and he became impatient to move, I endeavoured to remind him that we wished him to keep his position, by placing my hands before me, holding up my head, and assuming a grave and demure look. We now found that the old gentleman was a mimic, as well as a very good-natured and obliging man; for, whenever I did this, he always imitated me in such a manner as to create considerable diversion among his own people, as well as ours, and then very quietly kept his seat. While he was sitting for his picture, the other three stood behind him, bartering their commodities with great honesty, but in a manner which shewed them to be no strangers to traffic. If, for instance, a knife was offered for any article, they would hesitate for a short time, till they saw we were determined to give no higher price, and then at once consented to the exchange. In this case, as well as when any thing was presented to them, they immediately licked it twice with their tongues, after which they seemed to consider the bargain satisfactorily

1820. Sept. concluded. The youngest of the party very modestly kept behind the others, and, before he was observed to have done so, missed several presents, which his less diffident, though not importunate, companions had received. As the night closed in, they became desirous to depart, and they left us before dark, highly delighted with their visit. As I had purchased one of their canoes, a boat was sent to land its late owner, as only one person can sit in each. Mr. Palmer informed me, that, in going on shore, the canoes could beat our boat very much in rowing, whenever the Esquimaux chose to exert themselves, but they kept close to her the whole way. During the time that they were on board, we had observed in them a great aptness for imitating certain of our words; and, while going on shore, they took a particular liking to the expression of "Hurra, give way!" which they heard Mr. Palmer use to the boat's crew, and which they frequently imitated, to the great amusement of all parties.

Being desirous of seeing more of these people, of whom the first interview had given us a favourable impression, I determined to lie-to during the night, and to take the ships higher up the inlet on the following day. Mr. Bell came on board from the Friendship in the evening, and, after repeating his offers of assistance, communicated to us many events of a public nature, which could not but be extremely interesting to us, after a complete seclusion from the rest of the world for a period of seventeen months. The temperature of the sea at the bottom, in one hundred and ninety-five fathoms, was 31½°, and at the depth of seventy-six fathoms 31°.3; that of the surface water being 33°, and of the atmosphere 32°.

Thurs. 7. The calm weather which prevailed during the night, was succeeded by a breeze from the westward on the morning of the 7th, of which advantage was immediately taken to beat up the inlet, which proved a very extensive one, and of which a particular chart is annexed. The sun did not break through the clouds till half-after seven, when the expected eclipse was found to have commenced, and I determined to land, with Captain Sabine, upon the nearest island, in order to observe the end of it, as well as to obtain the other usual observations, together with angles for the survey. At ten minutes past eight the sun became again obscured, and was not visible till twenty minutes past nine, when we had landed, and were prepared with our glasses, but were disappointed, in finding that the eclipse was over.

Soon after we had landed, the old Esquimaux and one of his younger companions, paddled over from the main land, and joined us upon the island.

They brought with them, as before, some pieces of whalebone and seal-skin dresses, which were soon disposed of, great care being taken by them not to produce more than one article at a time, returning to their canoes, which were at a little distance from our boat, after the purchase of each of their commodities, till their little stock was exhausted. Considering it desirable to keep up among them the ideas of fair and honest exchange, which they already seemed to possess in no ordinary degree, I did not permit them to receive any thing as presents, till all their commodities had been regularly bought. While we were waiting to obtain the sun's meridian altitude, they amused themselves in the most good-natured and cheerful manner with the boat's crew; and, Lieutenant Hoppner, who, with Mr. Beverly, had joined us in the Griper's boat, took this opportunity of making a drawing of the young man. It required, however, some shew of authority, as well as some occasional rewards, to keep him quietly seated on the rock for a time sufficient for this purpose; the inclination they have to jump about, when much pleased, rendering it a penalty of no trifling nature for them to sit still for half an hour together. To shew their disposition to do us what little service was in their power, he afterwards employed himself in sharpening the seamen's knives, which he did with great expertness on any flat smooth stone, returning each as soon as finished, to its proper owner, and then making signs for another, which he sharpened and returned in the same way, without any attempt, and apparently without the smallest desire, to detain it. The old man was extremely inquisitive, and directed his attention to those things which appeared useful, rather than to those which were merely amusing. An instance of this occurred on my ordering a tin canister of preserved meat to be opened for the boats' crews' dinner. The old man was sitting on the rock, attentively watching the operation, which was performed with an axe struck by a mallet, when one of the men came up to us with a looking-glass. I held it up to each of the Esquimaux, who had also seen one the preceding evening, and then gave it into each of their hands successively. The younger one was quite in raptures, and literally jumped for joy for nearly a quarter of an hour: but the old man having had one smile at his own queer face, immediately resumed his former gravity, and, returning me the glass, directed his whole attention to the opening of the canister, and when this was effected, begged very hard for the mallet which had performed so useful an office, without expressing the least wish to partake of the meat, even when he saw us eating it with good

1820. Sept.

1820. Sept. appetites. Being prevailed on, however, to taste a little of it, with some biscuit, they did not seem at all to relish it, but eat a small quantity from an evident desire not to offend us, and then deposited the rest safely in their canoes. They could not be persuaded to taste any rum, after once smelling it, even when much diluted with water. I do not know whether it be a circumstance worthy of notice, that, when a kaleidoscope or a telescope was given them to look into, they immediately shut one eye, and one of them used the right, and the other the left eye.

In getting out of their canoes, as well as into them, great care is required to preserve the balance of these frail and unsteady coracles, and in this they generally assist each other. As we were leaving the island, and they were about to follow us, we lay on our oars to observe how they would manage this, and it was gratifying to see that the young man launched the canoe of his aged companion, and having carefully steadied it alongside the rock, till he had safely embarked, carried his own down, and contrived, though with some difficulty, to get into it without assistance. They seem to take especial care in launching their canoes, not to rub them against the rocks, by placing one end gently in the water, and holding the other up high, till it can be deposited without risk of injury. As soon as we commenced rowing, the Esquimaux began to vociferate their newly-acquired expression of "Hurra, give way," which they continued at intervals, accompanied by the most good-humoured merriment, as we crossed over to the main land. There being now a little sea, occasioned by a weather tide, we found that our boats could easily beat their canoes in rowing, notwithstanding their utmost endeavours to keep up with us.

The two Esquimaux tents, which we were now going to visit, were situated just within a low point of land, forming the eastern side of the entrance to a considerable branch of the inlet, extending some distance to the northward. The situation is warm and pleasant, having a south-westerly aspect, and being in every respect well adapted for the convenient residence of these poor people. We landed outside the point, and walked over to the tents, sending our boats, accompanied by the two canoes, round the point to meet us. As soon as we came in sight of the tents, every living animal there, men, women, children, and dogs, were in motion, the latter to the top of the hill out of our way, and the rest to meet us with loud and continued shouting; the word "*pilletay*" [give me] being the only articulate sound we could distinguish, amidst the general uproar. Besides the four

men whom we had already seen, there were four women, one of which being about the same age as the old man, was probably his wife; the others were about thirty, twenty-two, and eighteen years of age. The first two of these, whom we supposed to be married to the two oldest of the young men, had infants slung in a kind of bag at their backs, much in the same way as gipsies are accustomed to carry their children. There were also seven children, from twelve to three years of age, besides the two infants in arms, or rather behind their mothers' backs; and the woman of thirty was with child. 1820. Sept.

We began, as before, by buying whatever they had to dispose of, giving in exchange knives, axes, brass kettles, needles, and other useful articles, and then added such presents as might be further serviceable to them. From the first moment of our arrival until we left them, or rather until we had nothing left to give, the females were particularly importunate with us, and "pilletay" resounded from the whole troop, wherever we went: they were extremely anxious to obtain our buttons, apparently more on account of the ornament of the crown and anchor which they observed upon them, than from any value they set upon their use; and several of these were cut off our jackets to please their fancy. When I first endeavoured to bargain for a sledge, the persons I addressed gave me distinctly to understand by signs, that it was not their property, and pointed towards the woman who owned it; though my ignorance in this respect offered a good opportunity of defrauding me, had they been so inclined, by receiving an equivalent for that which did not belong to them: on the owner's coming forward, the bargain was quickly concluded. The pikes which I gave in exchange underwent the usual ceremony of licking, and the sledge was carried to our boat with the most perfect understanding on both sides. In another instance, an axe was offered by some of the Griper's gentlemen, as the price of a dog, to which the woman who owned the animal consented. To shew that we placed full confidence in them, the axe was given to her before the dog was caught, and she immediately went away with a kind of halter or harness of thongs, which they use for this purpose, and honestly brought one of the finest among them, though nothing would have been easier than to have evaded the performance of her contract. The readiness, however, with which they generally parted with their commodities, was by no means the effect of fear, nor did it always depend on the value of the articles offered in exchange; for, having, as I thought, concluded a bargain

1820. Sept. for a second canoe belonging to the old woman, I desired the men to hand it down to the boat: but I soon perceived that I had misunderstood her, for she clung fast to the canoe, and cried most piteously till it was set down; I then offered a larger price than before, but she could not be induced to part with it.

The stature of these people, like that of Esquimaux in general, is much below the usual standard. The height of the old man, who was rather bent by age, was four feet eleven inches, and that of the other men from five feet four and a half to five feet six inches. Their faces are round and plump in the younger individuals; skin smooth; complexion not very dark, except that of the old man; teeth very white; eyes small; nose broad, but not very flat; hair black, straight, and glossy; and their hands and feet extremely diminutive. The old man had a grey beard in which the black hairs predominated, and wore the hair rather long upon his upper lip, which was also the case with the eldest of the three others. One of these, we thought, bore a striking resemblance to our poor friend John Sackheuse, well-known as the Esquimaux who accompanied the former Expedition, the want of whose services we particularly felt on this occasion, and whose premature death had been sincerely lamented by all who knew him, as an intelligent and amiable man, and a valuable member of society.

The grown-up females measured from four feet ten to four feet eleven inches. The features of the two youngest were regular; their complexions clear, and by no means dark; their eyes small, black, and piercing; teeth beautifully white and perfect; and although the form of their faces is round and chubby, and their noses rather flat than otherwise, their countenances might, perhaps, be considered pleasing even according to the ideas of beauty which habit has taught us to entertain. Their hair, which is jet-black, hangs down long and loose about their shoulders, a part of it on each side being carelessly plaited, and sometimes rolled up into an awkward lump, instead of being neatly tied on the top of the head, as the Esquimaux women in most other parts are accustomed to wear it. The youngest female had much natural bashfulness and timidity, and we considered her to be the only unmarried one, as she differed from the other three in not being tattooed upon the face. Two of them had their hands tattooed also, and the old woman had a few marks of the same kind about each wrist. None of the men or children were thus distinguished.

The children were generally good-looking, and the eldest boy, about twelve

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

Drawn & Engraved by W. Westall A.R.A. from Sketches by Lieu.t Beechey & Hoppner

Esquimeaux of the Inlet called the River Clyde. West Coast of Baffin's Bay.

Published by John Murray London March 6 1821

ASIATIC SOCIETY MUMBAI

years of age, was a remarkably fine and even handsome lad. They were rather scared at us at first; but kind treatment, and a few trifling presents, soon removed their fears, and made them almost as importunate as the rest. 1820. Sept.

The dress of the men consists of a seal-skin jacket, with a hood which is occasionally drawn over the head, of which it forms the only covering. The breeches are also generally of seal-skin, and are made to reach below the knee, and their boots which meet the breeches are made of the same material. In this dress we perceived no difference from that of the other Esquimaux, except that the jacket, instead of having a pointed flap before and behind, as usual, was quite straight behind, and had a sort of scollop before in the centre. In the dress of the women there was not so much regard to decency as in that of the men. The jacket is of seal-skin, with a short, pointed flap before, and a long one behind, reaching almost to the ground. They had on a kind of drawers, similar to those described by Crantz, as the summer-dress of the Greenland women, and no breeches. The drawers cover the middle part of the body, from the hips to one-third down the thigh, the rest of which is entirely naked nearly as far as the knee. The boots are like those of the men, and besides these they have a pair of very loose leggins, as they may be called, which hang down carelessly upon the top of the boots, suffering their thighs to be exposed in the manner before described, but which may be intended occasionally to fasten up, so as to complete the covering of the whole body. The children are all remarkably well clothed; their dress, both in male and female, being in every respect the same as that of the men, and composed entirely of seal-skin, very neatly sewed.

The tents which compose their summer-habitations, are principally supported by a long pole of whalebone, fourteen feet high, standing perpendicularly, with four or five feet of it projecting above the skins which form the roof and sides. The length of the tent is seventeen, and its breadth from seven to nine feet, the narrowest part being next the door, and widening towards the inner part, where the bed, composed of a quantity of the small shrubby plant, the *Andromeda Tetragona*, occupies about one-third of the whole apartment. The pole of the tent is fixed where the bed commences, and the latter is kept separate by some pieces of bone laid across the tent from side to side. The door which faces the south-west, is also formed of two pieces of bone, with the upper ends fastened together,

1820. Sept. and the skins are made to overlap in that part of the tent, which is much lower than the inner end. The covering is fastened to the ground by curved pieces of bone, being generally parts of the whale; the tents were ten or fifteen yards apart, and about the same distance from the beach.

The canoe which I purchased, and which was one of the best of the five that we saw, is sixteen feet eleven inches in length, and its extreme breadth two feet one inch and a half; two feet of its fore-end are out of the water when floating. It differs from the canoe of Greenland, in being somewhat lower at each end, and also in having a higher rim or gun-wale, as it may be termed, round the circular hole where the man sits, which may make them somewhat safer at sea. Their construction is, in other respects, much the same; the timbers, or ribs, which are five or six inches apart, as well as the fore and aft connecting pieces being of whale-bone or drift-wood, and the skins with which they were covered, those of the seal and walrus. When the canoes are taken on shore, they are carefully placed on two upright piles or pillars of stones, four feet high from the ground, in order to allow the air to pass under to dry them, and prevent their rotting. The paddle is double and made of fir, the edges of the blade being covered with hard bone to secure them from wearing.

The spears or darts which they use in killing seals and other sea animals, consist, like the harpoons of our fishermen, of two parts, a staff, and the spear itself; the former is usually of wood, when so scarce and valuable a commodity can be obtained, from three and a half to five feet in length, and the latter of bone, about eighteen inches long, sometimes tipped with iron, but more commonly ground to a blunt point at one end, while the other fits into a socket in the staff, to which it is firmly secured by thongs. The lines which they attach to their spears are very neatly cut out of seal-skins, and when in a state of preparation, are left to stretch till dry, between the tents, and then made up into coils for use. They make use of a bladder fastened to the end of the line, in the same manner as the other Esquimaux. Besides the spears, we purchased an instrument having a rude hook of iron let into a piece of bone, and secured by thongs to a staff, the hook being sharply pointed, but not barbed. While we were on the island (to which I had applied the name of Observation Island), it happened that a small bird flew near us, when one of the Esquimaux made the sign of shooting it with a bow and arrow, in a manner which could not be misunderstood. It is remarkable, therefore, that we could not find about their tents any of these

weapons, except a little one five or six inches long, the bow being made of whalebone, and the arrow of fir, with a feather at one end and a blunt point of bone at the other, evidently appearing to be a child's toy, and intended, perhaps, to teach the use of it at an early age. 1820. Sept.

The runners of the only sledge we saw were composed of the right and left jaw-bones of a young whale, being nine feet nine inches long, one foot seven inches apart, and seven inches high from the ground. They are connected by a number of parallel pieces, made out of the ribs of the whale, and secured transversely with seizings of whale-bone, so as to form the bottom of the sledge, and the back is made of two deer's horns placed in an upright position. The lower part of the runners is shod with a harder kind of bone, to resist the friction against the ground. The whole vehicle is rudely executed, and, being nearly twice the weight of the sledges we saw among the northern Esquimaux, is probably intended for carrying heavy burdens. The dogs were not less than fifty or sixty in number, and had nothing about them different from those on the eastern coast of Baffin's Bay, except that they do not stand near so high as those of the latitude of 76°. They are very shy and wild, and the natives had great difficulty in catching them while we were by, as well as holding them in when caught. Some of them have much more of the wolf in their appearance than others, having very long heads and sharp noses, with a brushy tail, almost always carried between the legs; while the bodies of others are less lank, as well as their noses less sharp, and they carry their tails handsomely curled over their backs: their colour varied from quite dark to brindled. The ravenous manner in which they devour their food is almost incredible. Both the old and young ones, when a bird is given them, generally swallow feathers and all; and an old dog that I purchased, though regularly fed while on board by a person appointed for that purpose, eat up, with great avidity, a large piece of canvass, a cotton handkerchief, which one of the men had just washed and laid down by his side, and part of a check shirt. The young dogs will at any time kill themselves by over-eating, if permitted. The children appeared to have some right of property in the smaller puppies, or else their parents are very indulgent to them, for several bargains of this kind were made with them, without any objection or interference on the part of the parents, who were standing by at the time.

Within a few stones, irregularly placed in a corner of each tent, was a lamp of oil and moss, and over each of these was suspended a small stone vessel

1820. Sept. of an oblong shape, and broader at the top than at the bottom, containing a large mess of sea-horse flesh, with a great quantity of thick gravy. Some ribs of this meat were by no means bad-looking, and but for the blood mixed with the gravy, and the dirt which accompanied the cooking, might perhaps be palatable enough. I bargained with a woman for one of the stone vessels, giving her a brass kettle in exchange. Before she gave it into my possession, she emptied the meat into another vessel, and then, with the flap of her jacket, wiped out the remains of the gravy; thus combining with what our notions of cleanliness incline us to consider a filthy act, an intention of decency and a desire to oblige us, which, however inconsistent, it was still pleasing to observe. Some of their vessels are made of whale-bone, in a circular form, one piece being bent into the proper shape for the sides, and another flat piece of the same material, sewn to it for a bottom, so closely as to make it perfectly water-tight. Their knives are made of the tusks of the walrus, cut or ground sufficiently thin for the purpose, and retaining the original curve of the tusk, so as to resemble the little swords which children have as toys in England. As they do not appear to have any instrument like a saw, great time and labour must be required in making one of these knives, which seem to answer most of the purposes to which they have occasion to apply them.

From the description given to us by Mr. Williamson, we found that these were the same persons who had been seen by the Lee's people; but we had several proofs of their having had some previous communication, directly or indirectly, with the civilized world; such as some light blue beads, strung by themselves on thin leathern threads; and an instrument for chopping, very much resembling a cooper's adze, which had evidently been secured to a handle of bone for some time past, and of which the iron was part of an old file.

The short time which we were among them, as well as the want of an interpreter, prevented our obtaining much of the information which would have been interesting, respecting the language, manners, and number of this tribe of Esquimaux. They call the bear, *nennook;* the deer, *tooktook;* and the hare, *ookalik;* being nearly the same words as those used on the eastern coast of Baffin's Bay. As it was considered a matter of some interest to ascertain whether they were acquainted with the musk-ox, a drawing of that animal was put before the men who were on board. The small size of it seemed, at first sight, to confound them; but, as soon as a real head and horns were

produced, they immediately recognised them, and eagerly repeated the word *oomingmack*, which at once satisfied us, that they knew the musk-ox, and that this was the animal spoken of by the Esquimaux of Greenland, under the same name, somewhat differently pronounced. 1820. Sept.

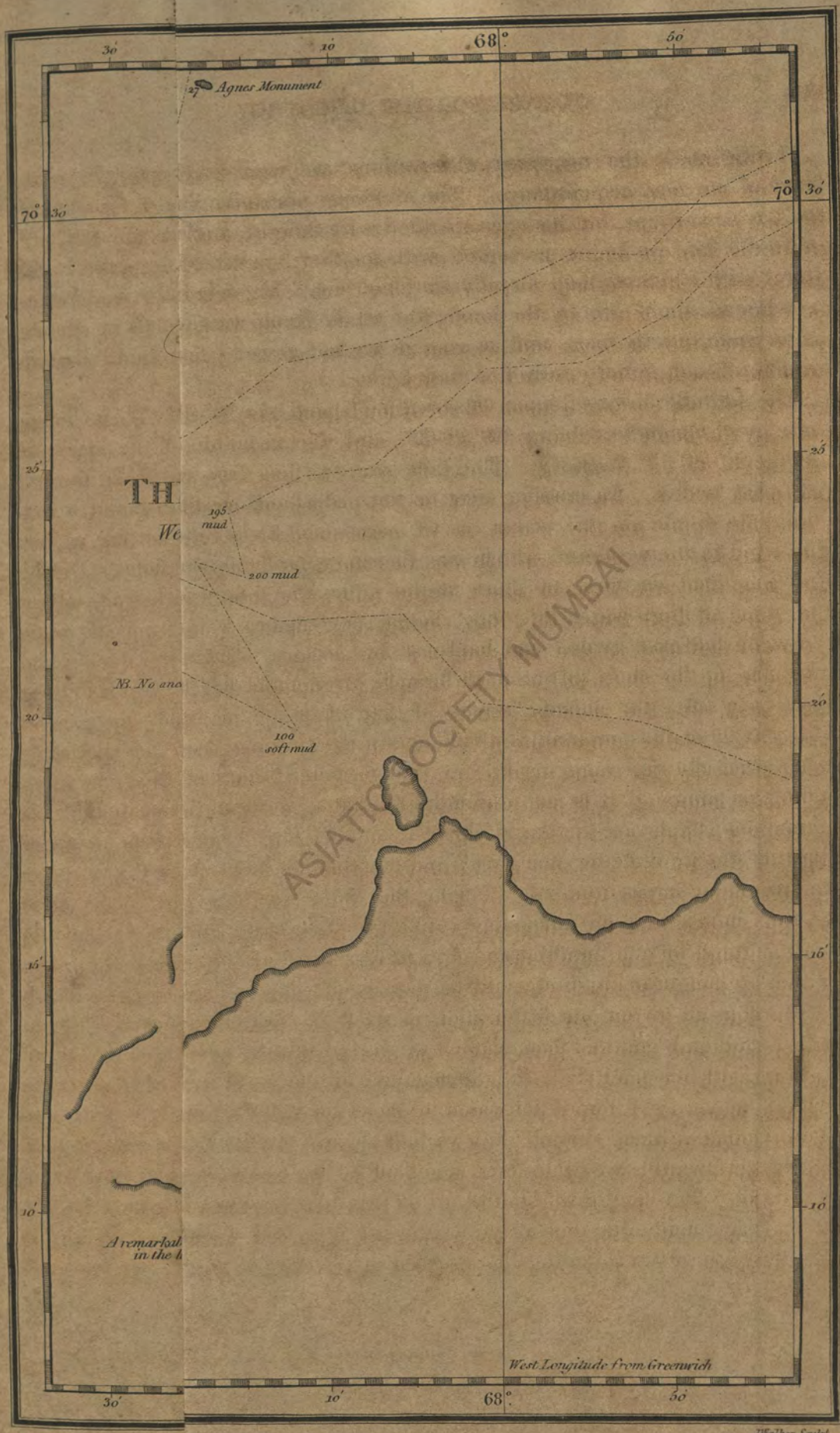
To judge by their appearance, and what is perhaps a better criterion, the number of their children, there could be little doubt that the means of subsistence which they possess are very abundant; but of this we had more direct proof, by the quantity of sea-horses and seals which we found concealed under stones, along the shore of the north branch, as well as on Observation Island. Mr. Fife reported that, in sounding the north branch, he met with their winter-huts, about two miles above the tents on the same shore, and that they were partly excavated from a bank facing the sea, and the rest built round with stones.

We saw no appearance of disease among the seventeen persons who inhabited the tents, except that the eyes of the old couple were rather blear, and a very young infant looked pale and sickly. The old man had a large scar on one side of his head, which he explained to us very clearly to be a wound he had received from a *nennook* (bear). Upon the whole, these people may be considered in possession of every necessary of life, as well as of most of the comforts and conveniences which can be enjoyed in so rude a state of society. In the situation and circumstances in which the Esquimaux of North Greenland are placed, there is much to excite compassion for the low state to which human nature appears to be there reduced; a state in few respects superior to that of the bear or the seal, which they kill for their subsistence. But, with these, it was impossible not to experience a feeling of a more pleasing kind: there was a respectful decency in their general behaviour, which at once struck us as very different from that of the other untutored Esquimaux, and in their persons there was less of that intolerable filth by which these people are so generally distinguished. But the superiority for which they are the most remarkable is, the perfect honesty which characterized all their dealings with us. During the two hours that the men were on board, and for four or five hours that we were subsequently among them on shore, on both which occasions the temptation to steal from us was perhaps stronger than we can well imagine, and the opportunity of doing so by no means wanting, not a single instance occurred, to my knowledge, of their pilfering the most trifling article. It is pleasing to record a fact, no less singular in itself, than honourable to these simple people.

1820. Sept. Having made the necessary observations, we went to the tents to take leave of our new acquaintance. The old man seemed quite fatigued with the day's exertions, but his eyes sparkled with delight, and we thought with gratitude too, on being presented with another brass kettle, to add to the stores with which we had already enriched him. He seemed to understand us when we shook him by the hand; the whole group watched us in silence, as we went into the boat, and, as soon as we had rowed a few hundred yards from the beach, quietly retired to their tents.

The latitude observed upon Observation Island was 70° 21′ 57″, its longitude by chronometers being 68° 28′ 33″, and the variation of the magnetic needle 80° 59′ 17″ Westerly. The tide rose two feet from half-past nine till half-past twelve. In crossing over to the main land, we then found a considerable ripple on the water, as if occasioned by a tide setting against the wind to the westward, which was, therefore, probably the flood. During the time that we were on shore at the tents, the tide was falling, so that the time of high-water this day (being new moon) would appear to be between half-past twelve and half-past one o'clock. Having walked some distance up the shore of the north branch, we thought that the water did not taste very salt; the specific gravity of that taken up near the ship at noon was 1.0223 at the temperature of 52°, and in the evening, a second experiment gave precisely the same result. In the particular chart of this fine inlet, which is annexed, it is not pretended to give an accurate delineation of the numerous islands and openings which it contains, our distance from the upper part of the inlet being too great, and our time too limited for this purpose. In stretching across from side to side, the water was found so deep, close to the shores, that no anchorage could be discovered, and in the middle was a depth of one hundred and fifty to two hundred fathoms; nothing like a rock or danger of any kind could be perceived, as far as the ships proceeded.

We bore up to run out of the inlet, at six P.M., passing between Observation Island and another immediately to the northward of it, and having no bottom with the hand-leads in mid-channel; off the north end of Observation Island, however, I found the water to shoal for about a hundred yards, and then deepen at once. Soon after we had cleared the inlet, the wind backed to the southward; we, therefore, stood off to the eastward, and hove-to till day-light. The land to the southward of this inlet becomes low next the sea, in the same manner as that to the northward of it, and a similar regularity in the decrease of the soundings is observed in standing in-shore; we had from



ASIATIC SOCIETY, MUMBAI

West Longitude from Greenwich
Plan
of the
INLET
called
THE RIVER CLYDE
West Coast of Baffins Bay
1820
No Anchorage could be found in any part of this inlet
The water deep in this branch of the Inlet
A remarkable black bluff with a low point off it
Low land
Low land near the sea
Stony Island
Observation Island
Green mud
Grey mud
Grey mud
A remarkable rock in the hill
Agnes Monument
West Longitude from Greenwich
Published as the Act directs March 1821 by John Murray

ASIATIC SOCIETY MUMBAI

fifty-seven to thirty-nine fathoms in the course of the night, in which depth we met with a number of icebergs aground. 1820. Sept.

The wind being contrary on the 8th, we made very little progress to the southward. The soundings continuing as regular as before, we stood inshore to eleven fathoms, and put the trawl overboard for an hour or two in the afternoon, bringing up a great quantity of sea-eggs (*Echini*), a few very small oysters, and some marine insects, but nothing that could furnish us with a fresh meal. The net was much broken by the roughness of the bottom, which consisted of very coarse sand and small stones; we tried it again in the evening, but with no better success. The weather was at this time remarkably fine and pleasant, and it was impossible for us not to contrast our present climate with that against which we had to contend about the same period the preceding year.

In proceeding to the southward, on the 9th, we passed a headland which, like another I have before mentioned, has exactly the appearance of three islands, when seen from the northward; a deception occasioned by three small hills near the point, situated upon comparatively low land. Having passed this headland, we discovered immediately to the southward of it a spacious bay or inlet, at least five or six leagues deep in the north-west part of it. The land at the bottom of this bay is high and mountainous, with every appearance of deep water near the shore; but in proceeding along shore to the southward, it again becomes low next the sea, with hills at the back, and with the same safe and regular soundings as before. Sat. 9.

We hove-to at noon to observe the meridian altitude upon a floe of ice, the land being too near to obtain it by the natural horizon. The latitude was 69° 24′ 37″, and the longitude 67° 05′ 43″.6, being in thirty-five fathoms at five or six miles from the land. The water from the bottom was at the temperature of 31°, that of the surface being 32°½, and of the air 34°. The wind dying away soon after noon, gave us an opportunity of trying the current by a boat moored to the bottom in nineteen fathoms, when it was found to be running somewhat less than a mile an hour in a S.½E. direction. At forty minutes past four P.M., it was again tried in a similar manner, when it was setting to the S.E., at the rate of three-quarters of a mile per hour; and, at seven o'clock, when we hove-to near Cape Kater, for the Griper to join us, we found it to be slack water. We stood off and on during the night, having from thirteen to twenty fathoms' water, with the intention of

1820. Sept. examining the large inlet which opens to the southward of Cape Kater. It now became obvious, that what had been mistaken for banks near Cape Kater on the preceding voyage were, in reality, only the regular shore soundings, which are in no respect different from those which occur in the whole space between this inlet and the river Clyde, at the same distance from the land. These soundings had appeared to indicate banks in 1818, because we came into them from an offing of several leagues; whereas, had we been running along shore, as in the present instance, we should have found a similar depth for near a hundred miles to the northward of Cape Kater, except at the mouths of the inlets where the water is always very deep.

There was a great deal of loose ice, and many bergs on this part of the coast; but we did not meet with the same obstruction off Cape Kater as on the former voyage. Several young black whales and a seal were seen in the course of the day.

Sun. 10. The wind being fresh and squally down the inlet, on the morning of the 10th, a press of sail was carried, for the purpose of examining it; but in the course of the forenoon we were obliged to close-reef the topsails, and send down the top-gallant-yards. We found this immense bay crowded with islands, which, together with its numerous openings, would require a considerable time to survey them accurately, and of the position of which, therefore, only a general idea is given in the annexed chart. Towards noon, a haze which had been resting over the western horizon cleared away, and we saw the land nearly all round the bay; but the distance at which we were was too great to enable us to ascertain satisfactorily its absolute continuity. Such, indeed, was the appearance of this magnificent inlet, of which the width of the entrance is not less than fifteen leagues, that it is highly probable some outlet may be found through it from Baffin's Bay into the Polar Sea; the strong westerly wind, and the intention I had formed of exploring this coast in a lower latitude, particularly about Cumberland Strait, prevented any further examination of it on this occasion. We crossed over, therefore, to the south shore, where we stood off and on till day-light should enable us to proceed to the southward. We passed, in the course of the day, the carcass of a dead whale, on which the fulmar petrels and ivory-gulls were feeding, in great numbers.

Mon. 11. As soon as day-light appeared, we took advantage of a light westerly breeze to stand to the south-east under all sail, but had soon the mortification to perceive that a compact body of floe-ice obstructed our passage to

the southward, stretching close in to the land a few miles a-head of us. At noon we were in latitude, by observation, 68° 19′ 45″, and longitude, by chronometers, 66° 05′ 45″, in two hundred and seventy-five fathoms, muddy bottom. The temperature of the sea at the depth of one hundred and forty-six fathoms, was 34°, the surface being at 32°, and the air 34°. This experiment differing from those which we had lately made as to the comparative temperature, we tried again in one hundred and sixty-five fathoms, and found it exactly the same as before. It must be remarked that, for each of the last three days, and for these only, we had found the ship between seven and eight miles to the southward of the reckoning. 1820. Sept.

The wind having fallen, we made little progress to the south-east, till the morning of the 12th, when a light breeze springing-up from the south-west, all sail was made to examine the state of the ice. On approaching the floes, however, we found such a quantity of bay ice, the formation of which upon the surface had been favoured by the late calm weather, that the Hecla was soon stopped altogether, a circumstance which gave us, as usual, much trouble in extricating ourselves from it, but not very material as regarded our further progress to the southward, the floes being found to stretch quite close in to the land, leaving no passage whatever between them. At noon we were still no farther to the southward than 68° 15′ 20″, and in longitude 65° 48′ 38″, the former agreeing very well with the reckoning. I was desirous of taking advantage of our present unavoidable detention, to make a set of observations on the irregularities of the magnetic needle on board the Hecla; but the young ice remained so tough during the day, notwithstanding the weather was calm and clear, with the thermometer at 65° in the sun in the course of the afternoon, that it was found impracticable to turn the ship's head in the desired direction for that purpose. The compasses now traversed very freely, and were made use of for the purposes of navigation, in the ordinary way; an account of the variation observed on different courses, as occasion offered, will be found among the other observations in the Appendix. Tues. 12.

Soon after ten P.M., the Aurora Borealis made its appearance; I am indebted to Captain Sabine for the following description of this phenomenon: "The Aurora was visible for upwards of half an hour, its appearance being comprised within about twelve points of the heavens, from S.E.b.E. to W.b.N., the magnetic north being about N. 76°. W. The character of this phenomenon was peculiar, being distinguished from those which we were accustomed to see at Melville Island, by the far greater rapidity with which it spread and

1820. Sept. shifted from one part of the heavens to another; by the depth and vividness of the colours, both of red and green, with which its coruscations were tinted; and by its streamers breaking out unexpectedly in places previously obscure, and extending indifferently downwards as well as upwards. The latter distinction was contrasted with the more usual appearance of rays streaming towards the zenith, from an arch of faintly brilliant light. An Aurora of similar appearance was observed in the Atlantic during the return of the Isabella, in October 1818, from Davis' Strait to Shetland. The peculiarities of the present phenomenon were more marked in the commencement than towards the conclusion of its appearance."

Wed. 13. On the 13th, which was nearly calm, the bay-ice had so much increased in thickness that the Hecla could not be moved through it, with the assistance of the boats, two of which were rendered unserviceable by the ice cutting their planks. We were off a small inlet, which, together with some islands discovered on this part of the coast, will be found upon the chart.

Thur. 14. On the 14th, having been set at liberty from the bay-ice by a breeze springing up, I determined to occupy no more time in the endeavour to get immediately along shore to the south-east, where the obstructions remained as before, but to run back a short distance along the ice to the northward, in order to endeavour to get round it if possible, and then to stretch in again towards the land. The ice had closed so much all round us, however, that we had some difficulty in finding a passage out of our present confined situation, which we at length effected before noon, passing by a chain of icebergs which were found to be aground in thirty-five to fifty fathoms, and which extending four or five leagues from the shore, sufficiently account for the obstruction offered by the floes in this place.

The temperature of the water at the bottom in thirty-five fathoms was 31°½, on the surface 32°, that of the air being 34°. A small fish, apparently of the whiting kind, was seen upon a piece of ice, and a great many black whales were near us in the course of this and the preceding day.

The extraordinary fine and clear weather which we experienced in the first fortnight of September is a circumstance worthy of remark: during that period, we had very little snow, and not one whole day's foggy weather. The fog was, perhaps, in some measure, avoided by keeping close in shore, as we occasionally perceived fog-banks in the offing, while we were enjoying clear weather near the land.

In attempting to sail to the eastward, we found the ice become more and more close, and a fog with sleet coming on obliged me to make the ships fast to a floe of considerable extent, and five or six feet in thickness, being in latitude, by account, 68° 24′ 18″, and longitude 63° 32′ 42″. We had here no bottom with six hundred and ten fathoms of line; the temperature of the sea at one hundred and seventy fathoms was 30°½, that of the surface being the same, and of the air 31°. 1820. Sept. Frid. 15.

As the sun was occasionally visible, notwithstanding the fog, a set of observations was begun for ascertaining the variation of the magnetic needle on board the Hecla; but these could with difficulty be obtained on ten points of the compass, after which the sun became again obscured. The thermometer fell to 23° at night, which was lower than we had before experienced it in the course of this month, and the fog froze hard upon the rigging.

The fog continued so thick on the 16th, as to oblige us to keep the ships fast to the floe. In the afternoon the deep-sea clamms were sent down to the bottom with two thousand and ten fathoms of line, which were fifty-eight minutes in running out, during which time no perceptible check could be observed, nor even any alteration in the velocity with which the line ran out. In hauling it in again, however, which occupied both ships' companies above an hour and a half, we found such a quantity of the line covered with mud as to prove that the whole depth of water was only eight hundred and nine fathoms, the rest of the line having continued to run out by its own weight, after the instrument had struck the ground. I have before had occasion to remark that, on this account, it is not easy to ascertain the actual depth of the sea in the usual manner, when it exceeds five or six hundred fathoms. A self-registering thermometer, which remained at the bottom for two hours and three-quarters, indicated a temperature of 27°*, that of the surface being 31°, and of the air 34°. Some cubes of wood, whose sides measured two inches, were also attached to the clamms, in order to try what increase of weight each kind would acquire by the pressure of the water at a great depth; the result, as ascertained by Mr. Edwards, is shewn in the following table:— Sat. 16.

* The instrument with which this experiment was made had been a good deal used for the same purpose, and did not, perhaps, indicate the temperature with very great accuracy.

1820. Sept.

	Original weight in grains.	Weight on coming to the surface.	Increase of weight.	Weight three hours afterwards.	Decrease in those three hours.
Ash . . .	1425	2324	899	2291	33
Fir . . .	863	2112	1249	1964	148
Oak . . .	1421	2252	831	2201	51
Elm . . .	1220	2299	1079	2201	98

Sun. 17. The wind shifting to the south-west on the morning of the 17th, we were nearly beset by the loose ice closing upon us, the ships being now on the windward side of the floe. After four hours' labour we succeeded in getting clear, and made sail among loose ice to the south-east. This course, however, we were not able to continue long, as the ice led us, in the course of the day, considerably to the northward; and, in the evening, an iceberg was selected, out of the numerous ones in sight, to which the ships were made fast before dark, it being impossible to keep them under-way during the night. We were not sorry to find some swell affecting the ships, such as we had not before experienced for more than twelve months, affording an indication of an open sea at no great distance from us. The loose and heavy pieces of ice which drifted-in under the lee of the berg, and on which the ships occasionally struck with some force, kept the people constantly employed during the night, in veering and heaving in to avoid coming in contact with them. Some bears were heard growling upon the berg, and some seals, ivory-gulls, and little auks, the latter in small flocks, were seen in the course of the day.

Mon. 18. On the 18th, the weather continued too foggy to move the ships in the forenoon. We tried for soundings with eight hundred and ninety-seven fathoms of line, without finding bottom; our latitude, by account, being 68° 24′ 03″; longitude 63° 08′ 12″. The temperature of the sea at the depth of three hundred and eighteen fathoms, was 30°, that of the surface being the same, and of the air 29°.

Soon after noon, the weather being somewhat less foggy, we cast off and made sail to the eastward. The ice here consisted generally of loose but heavy pieces, among which there was scarcely room to sail, and here and there a floe which obliged us to make several tacks. We also passed several

square pieces of floe-ice, which had evidently been cut out of a dock by some of the whalers in the course of the present season. The ships were secured to a berg at six P.M., and the wind having freshened up to a gale from the N.W.b.N., with some swell, we were much annoyed during the night by the ice which drifted under the lee of it, and on which the ships were constantly striking with a heavy shock, such as no others could long have withstood. This danger is avoided by ships lying very close under the lee of a berg, but a much greater is thereby incurred from the risk of the berg's upsetting; a circumstance which is always to be apprehended in a swell, and which must be attended with certain destruction to a ship moored very near to it. 1820. Sept.

At day-light on the 19th, we cast off from the berg, and occupied the whole of the day in unsuccessful attempts to get through the ice in to the land, of which we could only obtain a very distant glimpse, bearing from S. 24° W. to S. 69° W. By hauling to the north-eastward, we got into sufficiently clear water to enable me to keep the ships under way during the night; but, the wind falling light, great attention was requisite in avoiding the icebergs, which were numerous, and of large dimensions. Tues. 19.

The weather was so thick with snow on the 20th, that we could make no progress. At noon, being in latitude 68° 12′ 11″, and longitude 60° 50′ 19″, no soundings could be obtained with seven hundred and seventy fathoms of line. The temperature of the sea, at the depth of three hundred and eighteen fathoms, was 33°, that of the surface being 32°, and of the air 31°½. Wed. 20.

On the following day we sounded in two hundred fathoms, on a bottom of very fine sand and broken shells, and found the temperature of some water brought up from that depth in Dr. Marcet's bottle, to be 33°¼; that of the air at the same time was 30°, and of the surface-water 34°½, being the warmest we had observed for a considerable time. Thur. 21.

On the 23d, having run to the southward nearly as far as the latitude of Mount Raleigh, without being able to approach the land, the trending of the ice flattered us for some time with the hope of getting in with the coast; but at two P.M. we came to a compact and impenetrable body of it, over which we could not see any clear water from the mast-head, and which obliged us to haul off to the south-eastward. Sat. 23.

On the 24th and 25th we continued our progress to the southward, but without any better success in approaching, or even getting sight of, the land; the ice being as close and compact as when we sailed along the margin of it

1820. Sept. 24 & 25. in July of the preceding year. Soon after noon on the 24th, we crossed the Arctic Circle, having been within it fourteen months and three weeks; and at noon on the 25th had reached the latitude of 66° 13′ 14″, being two miles and three-quarters to the southward of the dead reckoning, which difference had occurred on each of the twelve preceding days.

Tues. 26. On the morning of the 26th we again stood to the westward as much as the ice would allow, but were soon obliged by it to keep away to the southward, precluding every hope of making the land on that part of the coast which it would have been most interesting to have explored. At noon we were in latitude 65° 41′ 09″, and longitude, by chronometer, 59° 09′ 54″. In the afternoon, after various attempts to get to the westward, appearances became more unpromising than ever, the packed ice extending from N.b.E. round to S.W. There were, indeed, parts of this ice which, with constant day-light, a ship might have entered with some probability of success; but, with twelve hours' night, the attempt must have been attended with a degree of risk, which nothing but a very important object could justify. The wind had now freshened up from the N.N.W., and the mercury in the barometer fell with unusual rapidity, with every other appearance of an approaching gale. I was, therefore, under the necessity of admitting the conclusion that, under existing circumstances, the season was now too far advanced, and the state of the ice too unfavourable to allow of any further examination of the coast; and I determined, therefore, to make the best of my way to England. The boats were accordingly hoisted in, and the ships made snug, while in smooth water, under the lee of the ice, and a course was then shaped to the E.S.E., in order to obtain an offing, before we bore away to the southward.

Having now finally taken leave of the ice, it may be proper to offer a few brief remarks as to the probable existence and accomplishment of a North-West Passage into the Pacific Ocean. Of the existence of such a passage, and that the outlet will be found at Behring's Strait, it is scarcely possible, on an inspection of the map, with the addition of our late discoveries, and in conjunction with those of Cook and Mackenzie, any longer to entertain a reasonable doubt. In discovering one outlet from Baffin's Bay into the Polar Sea, and finding that sea studded with numerous islands,

another link has at least been added to the chain of evidence upon which geographers have long ventured to delineate the northern coast of America, by a dotted line from Icy Cape westward, to the rivers of Mackenzie and Hearne, and thence to the known part of the coast to the north of Hudson's Bay, in the neighbourhood of Wager River; while, at the same time, considerable progress has been made towards the actual accomplishment of the desired passage, which has for nearly three centuries engaged the attention of the maritime nations of Europe. 1820. Sept.

The success which attended our efforts during the season of 1819, after passing through Sir James Lancaster's Sound, was such as to inspire even the least sanguine among us with a reasonable hope of the complete accomplishment of our enterprise, before the close of the next season. In entertaining such a hope, however, we had not rightly calculated on the severity of the climate with which we had to contend, and on the consequent shortness of the season, (not exceeding seven weeks), in which it is possible to perform the navigation of that part of the Polar Sea. Although it must be admitted, that there is something peculiar about the south-west end of Melville Island, extremely unfavourable to navigation, yet it is also certain, that the obstructions we met with from ice, both as to its thickness and extent, were found generally to increase, as we proceeded westward, after passing through Barrow's Strait. That we should find this to be the case, might perhaps have been reasonably anticipated, because the proximity to a permanently-open sea appears to be the circumstance which, of all others, tends the most to temper the severity of the Polar regions, in any given parallel of latitude. On this account I should always expect to meet with the most serious impediments about mid-way, between the Atlantic and Pacific Oceans; and having once passed that barrier, I should as confidently hope to find the difficulties lessen in proportion as we advanced towards the latter sea; especially as it is well known, that the climate of any given parallel on that side of America is, no matter from what cause, very many degrees more temperate than on the eastern coast.

But, although it is evident, that climate does not wholly depend on latitude, but on other circumstances also, (principally, perhaps, those of locality above-mentioned,) yet it can scarcely be doubted that, on any meridian to the north of America, for instance, 114° west where we were stopped, the general climate would be found somewhat better, and the navigable season longer, in the latitude of 69° than in that of 75°, near which

1820. Sept. we wintered. For this reason, it would perhaps be desirable, that ships endeavouring to reach the Pacific by this route, should keep, if possible, on the coast of America, and the lower in latitude that coast may be found, the more favourable will it prove for this purpose.

Our experience, I think, has clearly shewn that the navigation of the Polar Seas can never be performed with any degree of certainty, without a continuity of land. It was only by watching the occasional openings between the ice and the shore, that our late progress to the westward was effected; and had the land continued in the desired direction, there can be no question that we should have continued to advance, however slowly, towards the completion of our enterprise. In this respect, therefore, as well as in the improvement to be expected in the climate, there would be a manifest advantage in making the attempt on the coast of America, where we are sure that the land will not fail us. The probability of obtaining occasional supplies of wood, game, and anti-scorbutic plants; the chance of being enabled to send information by means of the natives; and the comparative facility with which the lives of the people might be saved, in case of serious and irreparable accidents happening to the ships, are also important considerations, which naturally serve to recommend this route. Should the sea on the coast of America be found moderately deep, and shelving towards the shore, (which, from the geological character of the known parts of the continent to the south, and of the Georgian Islands to the north, there is reason to believe would be the case for a considerable distance to the westward), the facility of navigation would be much increased, on account of the grounding of the heavy masses of ice in water sufficiently deep to allow the ships to take shelter behind them, at such times as the floes close in upon the land. Farther to the westward, where the primitive formation, and perhaps even a continuation of the Rocky Mountains, is to be expected, a steep and precipitous shore would probably occur, a circumstance which the foregoing narrative has shewn to be attended with much comparative uncertainty and risk.

The question which naturally arises, in the next place, relates to the most likely means of getting to the coast of America, so as to sail along its shores. It would, in this respect, be desirable to find an outlet from the Atlantic into the Polar Sea, as nearly as possible in the parallel of latitude in which the northern coast of America may be supposed to lie; as, however, we do not know of any such outlet from Baffin's Bay, about the parallels of 69° to 70°, the attempt is, perhaps, to be made with better chance of success in a

still lower latitude, especially as there is a considerable portion of coast that may reasonably be supposed to offer the desired communication, which yet remains unexplored. Cumberland Strait, the passage called Sir Thomas Rowe's Welcome, lying between Southampton Island and the coast of America, and Repulse Bay, appear to be the points most worthy of attention; and, considering the state of uncertainty in which the attempts of former navigators have left us, with regard to the extent and communication of these openings, one cannot but entertain a reasonable hope, that one, or perhaps each of them, may afford a practicable passage into the Polar Sea. 1820. Sept.

So little indeed is known of the whole of the northern shore of Hudson's Strait, which appears, from the best information, to consist chiefly of islands, that the geography of that part of the world may be considered altogether undetermined; so that an Expedition which should be sent to examine those parts, would soon arrive upon ground never before visited, and in which, from an inspection of the map in its present state, there certainly does seem more than an equal chance of finding the desired passage. It must be admitted, however, that any notions we may form upon this question, amount after all to no more than conjecture. As far as regards the discovery of another outlet into the Polar Sea, to the southward of Sir James Lancaster's Sound, it is evident that the enterprise is to be begun again; and we should be cautious, therefore, in entertaining too sanguine a hope of finding such a passage, the existence of which is still nearly as uncertain as it was two hundred years ago, and which possibly may not exist at all.

In the course of the foregoing narrative, it may have been remarked, that the westerly and north-westerly winds were always found to produce the effect of clearing the southern shores of the North Georgian islands of ice, while they always brought with them clear weather, which is essentially necessary in prosecuting discoveries in such a navigation. This circumstance, together with the fact of our having sailed back in six days from the meridian of Winter Harbour to the entrance of Sir James Lancaster's Sound, a distance which it required five weeks to traverse when going in the opposite direction, seems to offer a reasonable ground for concluding, that an attempt to effect the north-west passage might be made, with a better chance of success, from Behring's Strait, than from this side of America. There are some circumstances, however, which, in my opinion, render this mode of proceeding altogether impracticable, at least for British ships. The principal

1820. Sept. of these arises from the length of the voyage which must first be performed, in order to arrive at the point where the work is to be begun. After such a voyage, admitting that no serious wear and tear have been experienced, the most important part of a ship's resources, namely, the provisions and fuel, must be very materially reduced, and this without the possibility of renewing them to the extent necessary for such a service, and which can alone give confidence in the performance of an enterprise of which the nature is so precarious and uncertain.

Nor should it be forgotten how injurious to the health of the crews, so sudden and extreme a change of climate would in all probability prove, as that which they must necessarily experience in going at once from the heat of the torrid zone into the intense cold of a long winter upon the northern shores of America. Upon the whole, therefore, I cannot but consider that any expedition, equipped by Great Britain with this view, will act with greater advantage, by at once employing its best energies in the attempt to penetrate from the eastern coast of America, along its northern shore.

Whatever may be the result of any future attempt to decide this great geographical question, experience has shewn that, independently of any benefit which science may derive from such attempts, those already made have not been altogether without their use also in a commercial point of view. Previously to the return of the Expedition of 1818 from Baffin's Bay, the whale-fishery in that sea was almost entirely confined, during the best part of the summer-season, to the eastern or Greenland shores, where, at no very distant period, the number of whales was found sufficient to afford abundant employment for the numerous fleet of ships which are annually employed in this trade. For some years past, however, it has been observed, that it requires a much greater share of exertion than formerly, to procure the same supply of whales, these animals having been scared from South-East and North-East Bays, and the other southern parts of the coast of Greenland, which only a few years ago were considered a sure and abundant fishery, and retired to the northern and western parts of Baffin's Bay, where they have hitherto been but little molested. Such, indeed, is the general want of success on the old ground, that it is a common complaint among our whalers, that this fishery appears to be well nigh worn out. Above forty sail of ships accompanied the Expedition of 1818 up the coast of Greenland, nearly as high as the latitude of 76°, where the whales were found to be so abundant, as amply to repay the labour and exertions, by which our fishermen had suc-

ceeded in penetrating thus far through more than ordinary obstructions from ice. Encouraged by this success, and by the knowledge of our having subsequently crossed to the western coast of Baffin's Bay without much difficulty, the whalers began to extend their views beyond what had formerly been considered the utmost limits of the fishery, and accordingly in 1819, succeeded in penetrating the barrier of ice which occupies the centre of Baffin's Bay, and for the first time sailed over into Sir James Lancaster's Sound, and some of the other bays and inlets upon the same coast. In the course of that year's navigation, no less than fourteen ships were wrecked among the ice, but fortunately only one or two lives were lost. Not discouraged, however, by this disaster, the enterprising spirit of our fishermen led them, again, in 1820, to make the attempt to range over the whole of the northern and western parts of the bay in quest of whales. Such was the well-earned success which attended their efforts, that, in the course of that season, scarcely a nook or corner of this extensive bay remained unvisited by them. Mr. Bell in the Friendship, of Hull, whom I have before had occasion to mention, and one or two other of the ships sailed up to its very northernmost limits, entered Whale Sound, and were close off the entrance of Sir Thomas Smith's Sound; an exploit which has never before been performed since Baffin first discovered these inlets, above two hundred years ago. It has been seen, in the course of the foregoing narrative, in what situation we met with several of the ships on our return down the western coast in the autumn of 1820. The success which they met with on this occasion was such as has seldom occurred in the Davis' Strait fishery in any former season; and thus has a new and extensive field been opened for one of the most lucrative branches of our commerce, and, what is of scarcely less importance, one of the most valuable nurseries for seamen which Great Britain possesses. Nothing, indeed, can exceed the bold and enterprising spirit displayed by our fishermen in the capture of the whale. At whatever time of night or day, a whale is announced by the look-out man in the crow's-nest, the men instantly jump into the boats, frequently with their clothes in their hand, and with an alacrity scarcely equalled even in the most highly-disciplined fleet, push on in pursuit of the whale, regardless of cold and wet, and hunger, for hours, and sometimes days together. Nor is it solely on occasions where their immediate interest is concerned, that this activity is displayed by them. It happened, on the voyage of 1818, that in endeavouring to pass between the land and a body of ice

1820. Sept.

1820. Sept. which was rapidly closing the shore, the Alexander, then under my command, touched the ground just at the critical moment when it was necessary to push through the narrow and uncertain passage. It being nearly calm, the boats were sent a-head to tow, but the little way which they could give the ship was not sufficient to have rescued us in time from the approaching danger, and nothing less than the wreck of the ship was every moment to be expected. Several sail of whalers were following astern; but seeing the dangerous situation in which the Alexander was placed, and the impossibility of getting through themselves, they instantly put about into the clear water which we had just left, and, before we had time to ask for assistance, no less than fourteen boats, many of them with the masters of the ships themselves attending in them, placed themselves promptly a-head of the Alexander, and by dint of the greatest exertion towed her off into clear water, at the rate of three or four miles an hour, not one minute too soon to prevent the catastrophe we had anticipated.

The opening of a new whale-fishery on the western coast of Baffin's Bay, which constitutes an important era in the history of that trade, and for which the country is indebted to the researches of the expedition of 1818, under the command of Captain Ross, will, perhaps, render expedient a new mode of proceeding in the annual visits of our ships to this part of the Polar regions. It has hitherto been customary for a certain number of those intended for the Davis' Strait fishery, to occupy the early part of the season in what is called "the south-west," which is that part of the sea immediately to the eastward of Resolution Island, and in that neighbourhood. The ships frequently appear on this ground as early as the first of April, when the nights are long, the weather extremely cold and inclement, and with a heavy sea occasionally rolling in upon them from the Atlantic, making this, perhaps, upon the whole, the most severe fishery which is any where used by our whalers. They generally remain upon this coast, as near as the ice will permit them, till about the first or second week in June, not without considerable wear and tear to the ships, and the most harassing fatigue to the men, but seldom with a proportionate degree of success to repay their toil. After this, they strike over to the eastern or Greenland side, and prosecute the fishery on that coast in the usual way. I cannot but consider, that this "south-west" fishery might now be advantageously dispensed with altogether, and the expense of wages, provisions, and wear and tear, for the months of April, May, and June, entirely saved to the owners, or employed

in some more beneficial manner. By entering Davis' Strait no earlier than the first week in July, I feel confident, that a ship may ensure a "payable" cargo of fish before the end of the season, without incurring half the anxiety or risk which must always attend the navigation of that sea at an earlier period of the season. By doing this, a ship may, as I have before had occasion to remark, perhaps, reach the latitude of 73° or 74°, about the 20th or 25th of July, with very little obstruction from ice. In the course of this passage, it is, indeed, more than probable, that not a single whale will be met with, even though the ship should keep the whole way along the eastern margin of the ice. Not discouraged, however, by this circumstance, let her, on her arrival about the parallel of 73°, boldly enter the ice wherever it seems the most promising for getting through it to the western coast. In adopting this measure, there is doubtless much risk to encounter, but not more than in pushing on to the northward into Prince Regent's Bay, where, from the peculiar conformation of the land, which is extremely favourable for the retention of the ice, a serious obstruction may always be expected. 1820. Sept.

In effecting a passage through the central barrier of ice in Baffin's Bay, it is possible that one, two, or, in some seasons, even three weeks may be occupied; while in others, as in the year 1820, nothing but "sailing ice" may be found in a high latitude, through which a ship makes her way without difficulty. Having once effected this passage, however, there will, I apprehend, be still more than sufficient time for the accomplishment of their object, except in very unfavourable seasons, for we have the experience of three following years for asserting that an open sea will be found at that period to the westward, while the number of whales which we met with on that side of the bay seems likely to ensure to them, at least for some time to come, an easy and abundant fishery. For this purpose, however, the ships should be directed not to be in a hurry to leave the coast until the latter end of September, that month being by far the best in the year for the navigation of Davis' Strait and Baffin's Bay, and consequently affording greater facility, and much less risk, in the capture of whales. The apprehension which has, I believe, been entertained by some of the ship-owners, of their vessels being caught in the ice, so as to prevent their return, in consequence of remaining too late, is, as far as I have had an opportunity of judging, altogether without foundation, unless their stay be extended considerably beyond the period I have mentioned.

1820. Sept. How far the plan suggested above may be considered advantageous, as regards a late or an early market for the oil, or whether more profit may be expected by employing the ships in making a Baltic voyage, as is sometimes the case, after that from Davis' Strait is completed, than is likely to result from a full cargo of blubber at the end of the season, are circumstances of which I am not competent to form a judgment, and which must be left to the consideration of the ship-owners themselves. I shall only, therefore, add on this subject, that it has been suggested to me by one of those gentlemen, that a ship might, perhaps, be employed to great advantage, by occupying the early part of the season (till the middle of June, for instance,) at Spitzbergen, and then running down into Davis' Strait, to complete her fishery in the way I have proposed.

Wed. 27. We ran to the southward and eastward with a fresh and favourable breeze, and without meeting with any ice after leaving its main body, except one or two icebergs, and a few straggling pieces which, however, make it necessary to be very cautious in running at night, especially when there is any sea, the breaking of which cannot easily be distinguished from a mass of ice. On some occasions, therefore, it was necessary to heave-to for a few hours at night, a precaution which I should always recommend in the latter part of the season, till a ship has passed well to the eastward of Cape Farewell. It is remarked by the whalers, that they usually have a gale of wind to encounter off this headland in returning home from their fishery, which has also occurred on the two occasions on which I have passed it at this season. On the 30th of September, in the evening, there was every appearance of unfavourable weather, and the ships were made snug before dark. Soon after this, a gale came on from the northward and westward, which October. continued to blow hard, with little intermission, during the 1st and 2d of 1. & 2. October. The fall of the mercury in the barometer was, on this occasion, very gradual, and scarcely such, perhaps, as to be considered a fair warning of an approaching gale, being only from 29.49 at noon on the 30th, to 29.38 at six P.M., and 29.31 at midnight. On the morning of the 2d, it had fallen to 28.66, at which time the gale had been blowing hard for more than twenty-four hours. The wind had somewhat moderated on the

ABSTRACT of the METEOROLOGICAL JOURNAL kept on board His Majesty's Ship HECLA, at Sea, during the Month of *September*, 1820.

Day	Temperature of Air in shade.			Sea Water at the surface.			Barometer.			Prevailing Winds.	Prevailing Weather.
	Maximum.	Minimum.	Mean.	Temperature.	Specific Gravity.	Temperature when weighed.	Maximum.	Minimum.	Mean.		
	+ °	+ °	+ °	°		°	inches.	inches.	inches.		
1	33	30	31.67	30.7	1.0246	49	29.83	29.75	29.802	N. Westerly.	Moderate breezes and cloudy.
2	33	31	31.62	32.4	1.0243	55	29.89	29.82	29.860	N.N.W.	Light breezes and cloudy.
3	38	32	33.92	33.9	1.0242	57	29.83	29.73	29.800	N.W. Southerly.	Ditto ditto.
4	36	31	33.54	33.7	1.0240	57	29.71	29.63	29.682	S.E.	Ditto ditto.
5	41	31	36.12	33.9	1.0233	43	29.69	29.63	29.655	A.M. Westerly. P.M. N.E.	Moderate and cloudy.
6	32	29	30.54	32.7			29.76	29.64	29.704	N.N.E.	Light breezes and cloudy, with snow.
7	36	29	31.67	32.7	1.0223	53	29.73	29.62	29.670	W.S.W.	Light breezes and cloudy.
8	32	26	28.71	32.7	1.0223	54	29.61	29.56	29.580	South.	Ditto ditto.
9	34	27	31.37	32.2	1.0227	51	29.76	29.59	29.695	W.S.W.	Light breezes and fine.
10	35	31	32.58	32	1.0236	51	29.81	29.73	29.775	S.W.	Strong breezes and squally.
11	35	30	32.67	31.5	1.0202	53	29.69	29.50	29.588	Southerly.	Light breezes and cloudy.
12	36	26	31.17	31.6	1.0174	50	29.52	29.47	29.500	Round the Compass.	Light airs and fine clear weather.
13	33	29	31.29	31.5	1.0170	54	29.73	29.62	29.680	S.E.	Light breezes and cloudy.
14	35.5	30	31.96	31.5	1.0225	55	29.82	29.73	29.778	S.E. b. E.	Ditto ditto.
15	35	24	31.00	30	1.0243	54	29.74	29.59	29.665	S.S.E.	Moderate. Snow.
16	36	23	30.58	30.6	1.0243	55	29.72	29.50	29.622	E.S.E.	Light breezes and foggy.
17	36	28	31.46	30.5	1.0242	57	29.66	29.49	29.534	Westerly.	Light breezes and hazy.
18	32	26	29.21	30.5	1.0243	56	29.48	29.25	29.358	N.N.E. N.N.W.	Ditto ditto.
19	33	28	31.12	30.9	1.0249	54	29.49	29.32	29.412	N. E. by E.	Light breezes and hazy. Snow.
20	31.5	29	30.12	32.1	1.0248	55	29.62	29.50	29.577	W.N.W.	Ditto ditto. ditto.
21	32	29	30.58	32.8			29.60	29.55	29.572	N.W.	A.M. Moderate with snow. P.M. Light breezes and hazy with snow.
22	34	29	30.96	32.1	1.0255	49	29.57	29.55	29.565	Easterly.	Light breezes and cloudy.
23	34	30	31.42	31.7	1.0250	51	29.72	29.49	29.552	N.N.E. Southerly.	Light airs to fresh gales, cloudy.
24	36	30	32.50	32	1.0250	52	29.77	29.46	29.642	S.E. b.S.	Moderate and thick foggy weather.
25	35	30.5	32.67	33	1.0261	51	29.50	29.33	29.448	Southerly.	Moderate and foggy weather. Snow.
26	31	28	30.50	33.5	1.0254	50	29.35	29.05	29.228	Calm. N. b. W.	Calm and hazy to strong gales and hazy.
27	32	30	31.29	36.2	1.0259	51	29.38	29.00	29.225	N.N.W.	Fresh gales and squally. Snow.
28	34	31	32.33	39.4	1.0266	52	29.56	29.44	29.500	N.W. b. W.	Moderate and cloudy.
29	38	32	34.83	40.8			29.66	29.57	29.618	N.W. b. W.	Fresh gales and squally to calm. Snow.
30	43	34	36.79	41.5	1.0273	54	29.49	29.31	29.417	N.E.	Light airs and cloudy to fresh gales and squally.
	43	26	31.87	33.02			29.89	29.00	29.590		

1820. October. 3d, when the barometer had fallen as low as 29.14. In the gale which we experienced off Cape Farewell in 1818, the barometer was also much lower for two days after it had ceased to blow than while it lasted. During the time that we were in the Polar Sea, and especially while we were frozen up in Winter Harbour, we also remarked that a gale was accompanied, rather than preceded, by a fall of the mercury in the barometer; in moderate weather, it almost invariably rose with northerly and westerly winds, and fell with those from the south and east.

Mon. 2. On the 2d of October, in scudding before the wind, under the main-top-sail, a heavy sea struck the Hecla on the larboard quarter, rendering it necessary to press her forward under more canvass, by which we lost sight of the Griper in the course of the morning. As soon as the weather moderated, we hove-to for her; but, as she did not make her appearance, having, as we afterwards learned, been obliged to lie-to during the height of the gale, we continued our course out of the Straits, and did not again meet with the Griper till our return to England. After ten P.M. this night, the Aurora Borealis appeared at times in almost every part of the heavens, but most constantly in the southern quarter. It consisted of no distinct figure, either arch or pencils, but of a generally diffused white light, illuminating the atmosphere at times quite as much as the moon when six or seven days old. This phenomenon occurred almost every night during our passage across the Atlantic, rendering them extremely light, even when the weather was cloudy, just in the same manner that the moon does although her disk is not visible. When the weather was clear, it most frequently resembled the light of that luminary when issuing from behind a dark cloud.

Tues. 3. On the 3d we observed a more brilliant display than usual of this phenomenon. It appeared at nine P.M. in various parts of the heavens, from E.N.E., round by south, to W. b. N., principally consisting at first of many detached luminous patches like clouds, irregularly scattered about, and shifting frequently, though not very rapidly, from place to place. From the W. b. N. over to the S.S.E., and passing a few degrees to the southward of the zenith, there soon appeared a broad band of light, having a tendency to arch; and the light of which this consisted appeared to come from the west towards the east. In the E.N.E. quarter, there was a luminous appearance distinct from the rest, at about 15° or 20° of altitude, exactly resembling the light of the moon behind a dusky cloud, except that at times vivid coruscations shot upwards from it towards the zenith. At a quarter past ten the phenomenon suddenly became

much more brilliant, its general position and character remaining, however, nearly as before. It still appeared chiefly to the southward of the zenith, the arch-like appearance continuing with increased splendour, and accompanied for about a quarter of an hour by a beautifully waving light, of the rapidity and magnificence of which it is impossible to convey any adequate idea. The motion of this light reminded one of the contortions of a snake, except that its velocity was often so great that the eye could with difficulty follow it. The most intense part was of a pale greenish colour; the rest nearly white. The arch, which before had been stationary, at one time shifted its position, by appearing, as it were, to turn up its legs so as to form a part of a circle seen in perspective in the south, parallel to the horizon. The luminous patch, or cloud, in the E.N.E. increased also very much in brightness at the same time, emitting more vivid coruscations, but continuing, as before, quite distinct from the rest of the phenomenon. This Aurora, when brightest, gave nearly as much light as that of a full moon. There could not be the smallest doubt that it dimmed, and even sometimes altogether obscured, the stars over which it passed. We particularly remarked, that wherever there was a broad stream of its light stationary for some time in any part of the heavens, it produced exactly the effect of a curtain; for we could only distinguish stars of the first and second magnitudes *through* it, while those of inferior brilliancy were visible in great numbers by the side of it. In this, as in several previous instances, the Aurora appeared very near us, though it was evidently higher than some clouds which were passing, as might readily be distinguished by the latter intercepting a part of its light. The electrometer was tried during the most brilliant part of the phenomenon, but neither on this or on any other occasion, in crossing the Atlantic, did the gold leaf give any indication of electricity; nor was the magnetic needle in the slightest degree affected. The arch-like appearance above described was not bisected by the magnetic meridian, but by the magnetic N.E. and S.W. At a quarter before eleven the light became less brilliant, and spread more to the northward, and then gradually disappeared before midnight. 1820. October.

On the 11th, being in lat. 61° 11′, longitude 31° 12′, some water brought up from a depth of three hundred and twenty fathoms, in Dr. Marcet's bottle, was at the temperature of 44°¼, the surface water being at 47°½, and the air 48°. Wed. 11.

At seven P.M., on the 13th, the wind being squally from the N.N.W., the Aurora Borealis began to display itself in a bright luminous patch in Frid. 13.

1820. October. the north-east, resembling, as usual, the light of the moon behind a dark cloud. From this point faint and narrow coruscations shot upwards, passing a little to the north-westward of the zenith, and appearing to come down in the W.b.S. The blue sky between these streams of light, looked at first like so many dark streaks or clouds, until the eye had become accustomed to it, and the clearness of the stars in them explained the deception. In half an hour after, a bright arch, 34° high in the centre, and about 2° in breadth, extended from the luminous patch in the N.E. over to the W.S.W., so that the magnetic meridian would nearly bisect it. This part of the phenomenon remained about an hour, and then became faint, but the Aurora continued to give a considerable light, as usual, during the rest of the night.

Sat. 14. The mercury in the barometer fell gradually, but very slowly from midnight on the 11th, (when it was at 30.34 inches), till nine A.M., on the 14th, at which time it stood at 29.32 inches, and a hard gale of wind came on so suddenly as scarcely to give us time to save the masts and yards. It is remarkable that, immediately after this the mercury in the barometer rose to 29.36 inches, and continued so very steadily till nine P.M., when it once more gradually descended till it had reached 28.83 on the morning of the 16th. The gale continued to blow almost without intermission for four successive days.

Mon. 16. On the afternoon of the 16th, the sea being very high and irregular, and the ship pitching with considerable violence, the bowsprit was carried away close to the gammoning, and the foremast and main-top-mast immediately followed it over the side. The wreck was quickly cleared; and, by the greatest activity and energy on the part of the officers and men, the main-yard and mainmast were saved, the latter having been endangered by the foremast falling across the stay, and the former by the wreck of the main-top-mast and top-sail-yard lying upon it. Notwithstanding the continuance of the gale, and the uneasy motion of the ship for the next two days, we succeeded in getting up our jury-masts, so as to make sail on the evening of the 18th.

Thur. 26. Nothing material occurred till the afternoon of the 26th, when we struck soundings in seventy fathoms, on a bottom of coarse sand and broken shells, being in latitude 59° 55′, longitude 4° 17′ west. The weather being calm, some fishing-lines were put over, and several fine cod and torsk were caught, being the first we had met with since leaving Fair Island, at the commence-

Frid. 27. ment of the voyage. On the following day, we made Foul Island, bearing

S. 54° E., distant eleven leagues. Previously to our parting company with the Griper, I had given Lieutenant Liddon an order, in case of separation, to repair to Lerwick in the Shetland Islands, and to wait a week there for my arrival. On the morning of the 28th, however, being between Fair Island and the Orkneys at daylight, and the wind being fresh from the northward, I determined to proceed at once to Leith, where the necessary repairs of the Hecla's masts and rigging would be more quickly and effectually completed, previously to her venturing upon the English coast, and I should have an earlier opportunity of repairing to London, agreeably to my Instructions, to lay before my Lords Commissioners of the Admiralty a full account of the voyage. 1820. October. Sat. 28.

On the 29th we made Buchaness, and on the following day, the wind having come to the southward, so as to make our progress very slow, I landed at Peterhead, accompanied by Captain Sabine and Mr. Hooper; having first, in compliance with their Lordships' directions, demanded from the officers, petty-officers, and all other persons on board the Hecla, the logs, journals, charts, drawings, and other documents which the voyage had furnished, and directed Lieutenant Beechey to proceed with all possible dispatch to Leith. Having left Mr. Hooper at Leith, to report the Hecla's arrival to Rear-Admiral Otway, the commander-in-chief at that port, and to provide fresh beef and vegetables for our people, Captain Sabine and myself proceeded without delay to London, where we arrived on the morning of the 3d of November. Sun. 29.

Such was the excellent state of health which we at this time continued to enjoy on board the Hecla, that, during the whole season of our late navigation from Winter Harbour to the coast of Scotland, being a period of thirteen weeks, not a single case had been entered on our sick-list, except from one or two accidents of a trifling nature; and I had the happiness of seeing every officer and man on board both ships, (with only one exception out of ninety-four persons), return to their native country in as robust health as when they left it, after an absence of nearly eighteen months, during which time we had been living entirely on our own resources.

1820. The Griper arrived at Shetland on the 1st of November, and the Hecla at Leith on the 3rd. Both ships came into the River Thames about the middle of November, and were paid off at Deptford on the 21st of the following month.

END OF THE NARRATIVE.

ASIATIC SOCIETY MUMBAI

APPENDIX I.

AN ACCOUNT OF THE GOING OF THE CHRONOMETERS OF THE HECLA AND GRIPER.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

APPENDIX.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

N^{o} I.

AN ACCOUNT OF THE GOING OF THE CHRONOMETERS OF THE HECLA AND GRIPER.

THE number of chronometers embarked in the Expedition amounted altogether to fourteen, whereof twelve were in boxes, and two for the pocket.

The proportion supplied by government was three box chronometers to each ship, and a pocket watch additional for the Hecla.

The makers and distribution of the government watches were as follows, viz.:

To the HECLA.

Parkinson and Frodsham's	No. 228
Arnold's	2109, a pocket chronometer.
Arnold's	369
Arnold's	404, an eight-day chronometer.

To the GRIPER.

Arnold's	497, an eight-day chronometer.
Arnold's	367
Arnold's	377

No. 228, of Messrs. Parkinson and Frodsham, had been sent on trial in the voyage of discovery to Baffin's Bay in 1818, at the risk of its makers, whose property it then was. A favourable report having been made on return, of its going, the Admiralty were pleased to order its purchase for the public service. In consequence of such encouragement, Messrs. Parkinson

and Frodsham determined on sending three chronometers on trial on the present occasion; accordingly their Nos. 253 and 254 were delivered to Captain Sabine in the beginning of April, 1819, and No. 259 a few days before the expedition sailed, being intrusted jointly to Captain Parry's care and his. No. 286, an eight-day chronometer of Messrs. Finer and Nowland, was also placed in Captain Sabine's charge, on a similar adventure. Arnold's No. 25, and 523, (the latter a pocket chronometer,) being both the property of Henry Browne, Esq. F.R.S., were with Captain Sabine in this as in the preceding voyage. These seven, the property of individuals, were all on board the Hecla, making her total complement nine box, and two pocket chronometers.

The box chronometers (with the exception of 286, for the first five weeks) were suspended from the beams of the deck in the after-cabin, in canvass cots lined with green baize. Steel springs had been furnished by Messrs. Parkinson and Frodsham, to be attached, instead of beckets, to the eyes of the cot-clews, with a view to take off the effect of jars which the ship might receive when navigating amongst ice; but the springs giving way in one or two instances, (fortunately, however, without injurious consequences,) and the suspension by the eyes of the clews, or by very short beckets appearing in other respects preferable, the springs were removed. The motion of some of the larger chronometers was checked by pulleys attached to the sides of their cots.

An apparatus for suspending 286 had accompanied it from the makers, devised by Mr. Jennings, patentee of the insulating compasses, and approved by Messrs. Finer and Nowland. It consisted of a copper cylinder upwards of a foot in length, and an inch and a half diameter, closed at the bottom and surmounted by a basin of sufficient capacity to receive the chronometer box. The basin was suspended in gimbals by lanyards from the deck, and a small quantity of mercury poured into the copper cylinder. To the bottom of the chronometer box was affixed a cylindrical wooden leg of rather less diameter than the copper tube, into which it entered, resting on the mercury, and bearing the weight of the chronometer. In the first few days after the ships had sailed, it was remarked that the motion, by this mode of suspension, was more lively than by the cots, and that in heavy rolls the chronometer box was brought in contact with the framework containing the gimbals; this latter inconvenience might have been remedied by pouring more mercury into the cylinder, but at the expense of increasing the motion

already too great, inasmuch as it would have raised the chronometer still higher above the level of suspension. Moreover, as 286 was going, so far as could be judged by its daily comparison with the others, with remarkable steadiness, no alteration was made. It continued to go equally well until the afternoon of the 8th of June, when, the ship having considerable motion, it stopped; having been wound on the 6th, the index of the spring stood at nearly two days and a half. It was then determined to remove it into a cot similar to the others; in which being placed it was set going on the 9th, and was found to have again stopped at the noon comparison of the 10th. A third attempt to keep it going was alike unsuccessful; it was, therefore, laid by for a time; but, being again set in motion in the following month (July), it continued to go, though not with the same regularity as in the first month.

No. 523 was worn in the pocket generally, and 2109 occasionally during the voyage.

The chronometers were wound up and compared each day at noon, by Mr. Hooper and Capt. Sabine.

The six box chronometers supplied by the Admiralty, and three of those which were individual property, were placed in Captain Sabine's charge in the beginning of April, 1819, being five weeks before the sailing of the expedition; this period was sufficient to form a judgment of the dependance which might be placed on each chronometer, in maintaining a steady and uniform rate from day to day; it was also sufficient for the assignment of such rates, as might serve the ordinary purposes of navigation, until opportunities should present themselves *on the voyage*, of ascertaining the rates which they should have actually taken up on board with the exactness required on an occasion of discovery; and it may be remarked, that no length of previous trial can enable a conclusive inference to be drawn, of the rates which may be subsequently maintained, on account of the liability to alteration, which has been noticed in chronometers, of otherwise the best reputation, on being removed from the shore to shipboard.

An account is given, in Table I., of the going of these nine chronometers, during the five weeks of trial before their embarkation.

All the chronometers designed for the expedition having been collected by the first week in May, they were embarked from Somerset House on the seventh, the differences of each on mean Greenwich time, having been carefully noted at the preceding midnight.

The ships having arrived in Davis' Strait, using the temporary rates assumed from the five weeks of previous trial, a sufficient number of lunar observations were obtained during the lunations of June and August, to entitle the mean result to considerable confidence; being in all 1,209 distances, whereof 640 were with the sun *west* of the moon, and 569 with the sun *east* of the moon; the difference of each chronometer was noted on the mean Greenwich time, thus determined, at noon of the 22d of July, being the middle day of the observations; and these differences being compared with those at midnight on the 6th of May, the gain or loss of each chronometer in the interval of seventy-six days and a half became known, and consequently their corrected daily rates on board; the detail of these comparisons will be found in a memorandum annexed to the abstract of lunar observations in June and August, 1819.

The daily comparison of each chronometer with all the others, had also served in this interval, to guide the selection of those which had gone most steadily and uniformly, and had best preserved a mean rate, to be used in the determination of longitudes; these were Nos. 228, 254, and 259 of Messrs. Parkinson and Frodsham, 25, 369, and 404 of Arnold; No. 228 was also chosen as the watch by which the time of all observations should be noted, its rate being small and very uniform.

No other opportunity of lunar observation and consequent comparison with Greenwich time occurred to any extent, until the ships were secured for the winter, about the end of September, in a small harbour in Melville Island, which had been passed early in the month, but to which they were obliged to return; it had fortunately happened, that Captain Sabine had landed on a low point within three miles of this harbour, when passing it on the 6th of September, and had ascertained its longitude by the six chronometers above-mentioned; this point was sufficiently near to be included in a very careful survey of the harbour and adjacent coast, made by Captain Parry in the spring ensuing, whereby the bearing and distance of the point from the ship's winter station was correctly determined, and its chronometrical longitude thereby brought in comparison with its true longitude, deduced by a mean of 6,862 lunar distances observed during the winter, and carried to the point of land by means of the survey.

The detail of this comparison will also be found in the memorandum alluded to; the error of the chronometrical longitude, using the corrected rates ascertained by means of the lunars of June and August, proved in

distance less than a geographical mile; an amount so trivial, that it was not deemed necessary to pursue its further consideration; and rates, which, at the expiration of four months, had produced so very close an accordance with the result of so great a number of lunar observations, were judged to require no further correction.

The navigation of 1819 may be considered to have closed on the 6th of September, so far as the going of the chronometers is concerned, since the coast, to the westward of Winter Harbour, was laid down entirely by longitudes determined in the summer of 1820.

In Table II. is exhibited an account of the going of the six chronometers of the Hecla which were selected for the determination of longitude, from the commencement of the voyage to the close of the navigation of 1819. The actual daily rate of each chronometer, averaged in weeks, is shewn successively on every one of the other five.

In Table III. is shewn the daily rate (also on a weekly average, and for the same period) of the remaining chronometers of the Hecla's complement, on mean Greenwich time, as shewn each day at noon by No. 259, with its correction applied for rate and original difference. No. 259 has been selected for this purpose, because it is believed to have preserved the most steady and uniform rate throughout the season; the ground of this belief is, that its daily longitudes with the same unchanged rate, were not found to differ from the mean longitude of the six chronometers, so much as two minutes in a single instance during the four months, and but very rarely so much as one minute; this fact may be examined by a reference to the Table, closing the abstract of latitudes and longitudes determined in 1819, in which the daily longitude by each chronometer separately is shewn, as well as by their mean. It is considered to afford a presumption of very remarkable steadiness.

Table IV. contains a statement of the going of the chronometers on mean time at Winter Harbour, from the end of September 1819, to the end of April 1820.

During the severest months of the winter, the chronometers were suspended within five feet of the cabin stove, where they received as much advantage as could conveniently be given them from the moderate fire, which the necessary attention to economy of fuel permitted to be kept up.

The extremes of temperature of each day were noted by a self-registering thermometer suspended amongst them; the Table shews the highest and lowest degrees, as well as the mean temperature of each week; the latter being the mean of the daily extremes divided by fourteen.

The occasional stoppage of some of the chronometers, and the irregularity of others shew, that notwithstanding the precautions which were adopted, the cold which was experienced was greater than they had been prepared to meet.

No. 25 was the soonest affected, stopping, (on two occasions) at about 15° Fahrenheit; the compensation of this watch was also faulty, as its rate varied exceedingly with changes in the temperature. The stoppages were conjectured to be owing to the congealment of the oil. No. 369 stopped at 10°, and 404 at 6° of the thermometer scale. It is also presumed, that No. 369 was nearly stopped in the third week of November, when at the temperature of 15°, it lost in one day 47 seconds, and in the next above a minute, effects too considerable in a usually very steady going watch, to have been caused by defect in compensation.

The chronometers of Messrs. Parkinson and Frodsham appear to have been far better prepared for the peculiar service on which they were employed, than any other of the box chronometers; no instance occurred of any one of them being stopped by the cold. The rate of 228 experienced, indeed, considerable alteration in the three weeks of severest exposure in February and March; 254 and 259 were affected, but in a much less degree, whilst the compensation of 253 could scarcely have been better.

Mr. Arnold's pocket chronometers, 2109 and 523, underwent severer trials in the course of the winter, from natural cold, than it is probable chronometers were ever subjected to before, having been used in lunar observations frequently for three and four hours together, at temperatures from −20° to −40°. and even so low as −45°. There was certainly a limit of exposure (in degree and continuance) beyond which neither of these watches would go, as 2109 stopped on two occasions, and 523 once, as noted in the Table; (it is likely also that 523 was about to stop on the 29th of November, when on being taken into the cabin, it was found to have lost 43 seconds on a chronometer with which it had been compared but a few minutes before.) But this limit was at a very low temperature continued for a considerable time, and when the cold was not sufficient to cause their stoppage, its effect on their usual rate was very small; this was especially the case with 2109, in which

respect, as well as in the steadiness of its daily rate, this watch proved a very great acquisition.

The stoppage of the chronometers during observations was prevented after the experience on the above-mentioned occasions, by placing them on tin cases, filled with moderately-heated sand, which was renewed as occasion required.

No. 404 stopping from some unknown cause, on the 22d of March, it was laid aside during the remainder of the voyage.

Early in May, the chronometers of the Griper were sent on board the Hecla, for the purpose of having their rates examined previously to the sailing of the expedition from Winter Harbour.

Table V. contains an account of the going of seven chronometers of the Hecla, and three of the Griper on mean time, from the eighth of May to the end of July, being the twelve weeks preceding the commencement of the navigation in 1820.

No. 369 is omitted in this Table; when taken down to be wound on the 13th of June, it was found to have stopped at four turns of the chain, six and a half being equal to twenty-four hours; there appearing no particular cause for the stoppage, it was again set going, but stopped after having gone about two hours; the same took place on a third trial, when it was laid aside. It was probably injured by the winter's cold, as it never took up a steady rate after its stoppage in February. The attempt to keep it going was renewed in September, but proved as unsuccessful as in June, after which it was reserved for the examination of the maker.

On due examination of the going of the chronometers, at Melville Island, exhibited in Table V., it was apparent, that of those which belonged to the Hecla, the four of Messrs. Parkinson and Frodsham, were principally to be relied on in the determination of longitudes in the ensuing season.

The opportunities of lunar observation during the navigation of 1820 were few, and under circumstances by no means favourable; in consequence, an occasion did not present itself of comparison with Greenwich time, between the departure of the ships from Winter Harbour, and the arrival of the Hecla at Leith, on the 12th of November; on which day, the difference of each chronometer on Greenwich time, was ascertained by direct comparison with the Observatory clock at Calton Hill.

The following statement will shew the degree of correctness with which these four chronometers had maintained their respective rates, deduced from their going in the last three months at Winter Harbour; the same which are specified in Table V., under the title of "Average daily rates."

The difference of each chronometer, on mean observatory time at Winter Harbour, is given in Table V.; the observatory time was 5″.3 slow of mean time at the Hecla's winter station, as deduced from the bearing and measured distance; the difference of the meridians of Greenwich and of the Hecla's station, was 7h. 23m. 14s. the longitude of the latter being 110° 48′ 30″ west; these data give the differences of the chronometers on Greenwich time on the 31st of July, as follows:—

		h.	m.	s.
228	slow	3	15	06.3
253	—	1	29	49.2
254	—	0	17	07.4
259	—	0	47	25.

By applying to each chronometer the allowance for its rate in 104 days, agreeably to the average daily rates in Table V., and adding 11m. 22.5s. to No. 253, in compensation of an accidental stoppage to that amount on the 3d of September*, the differences of the chronometers on Greenwich time on the 12th of November, conformably to the rates, are as follows:—

		h.	m.	s.
228	slow	3	05	00.3
253	—	2	29	06.18
254	—	0	20	33.32
259	—	0	45	13.
		6	39	50.8

* Mr. Hooper and Captain Sabine having accompanied Captain Parry on shore on the west coast of Davis' Strait, on this day, their return to the Hecla was delayed by unforeseen circumstances until between five and six hours beyond the usual time of winding the chronometers. Fortunately 253 was the only one which had gone down; being wound up and set in motion, it was compared with the other chronometers, and due allowance having been made for its rate since the comparison at noon of the preceding day, it was found to have been stopped for 11m. 25.5s., which loss is accordingly brought into the account.

Their *actual* differences, ascertained by comparison at the observatory at Calton Hill, were,

		h.	m.	s.
228	slow	3	04	05.03
253	—	2	29	40.48
254	—	0	21	22.68
259	—	0	44	35.35
		6	39	43.54

The difference being divided by 4, (the number of the chronometers) gives 1'.815 fast, as the error of the Greenwich time shewn by the chronometers at the end of 104 days, on being allowed the average daily rates at which they had gone for the three months preceding the period.

The longitude of the western parts of Melville Island, and of a considerable portion of the western coast of Baffin's Bay, and Davis' Strait which were surveyed in the season of 1820, have been accordingly determine by the mean of these four chronometers, using the above-mentioned rates.

Table VI. exhibits the daily rate of these chronometers, and of No. 2105, each successively on the other four, averaged in weeks, from the commencement to the close of the navigation of 1820.

The ships having arrived at Deptford, the chronometers were delivered on the 1st of December, to steady persons sent by their makers to receive them.

Table VII. contains a statement of their daily going on time since their return to London; the materials of this statement have been furnished by the makers, who had not received any intimation of the previous rates.

Admirably as these chronometers have fulfilled the purposes for which they were employed, it is an additional satisfaction to find, that, notwithstanding the change of circumstances attendant on their disembarkation, and replacement in their makers' care, they are still maintaining almost without exception, their Melville Island rates.

Nos. 369 and 404, which had stopped in the winter at Melville Island, without any apparent cause, and had been reserved for Mr. Arnold's ex-

amination, have been taken to pieces since their return. Mr. Arnold states that he found the main springs of both the watches broken; accidents which may have arisen from a flaw in the steel, or simply from the severity of the cold, as experience has shewn, that more main-springs break in frosty weather, than at other seasons.

No. 286 has also been examined by Messrs. Finer and Nowland: the cause of its stoppage and subsequent irregularity, is discovered to have been the rusting of a spring connected with the teeth of the index wheel, which shews the number of days passed since the chronometer was wound. The introduction of this wheel, which, with ordinary attention, is not required, is particularly to be regretted on the present occasion, as from the very steady going of this watch before the accident took place, there appeared every prospect of its doing great credit to its makers.

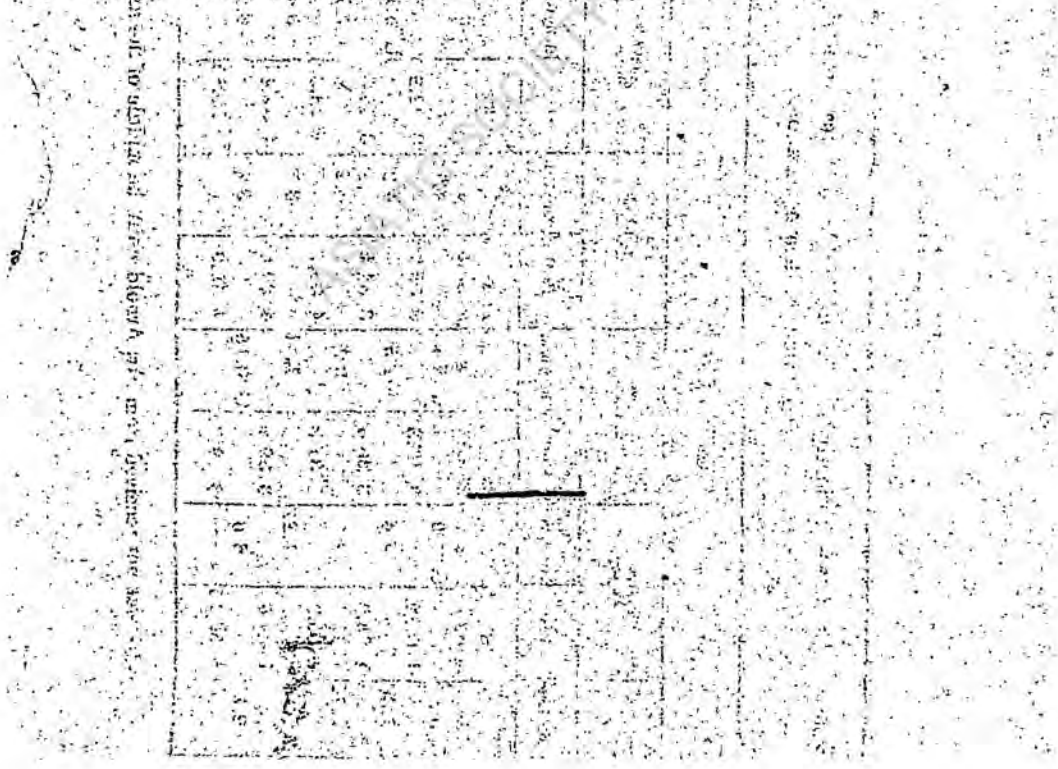


TABLE I.

AN ACCOUNT of the going of the under-mentioned CHRONOMETERS, on Mean Greenwich Time, during a Trial of Five Weeks, in London, previous to their embarkation.

1819	ARNOLD'S										PARKINSON AND FRODSHAM'S					
	367		369		377		404		497		228		253		254	
	Fast	Daily Rate	Fast	Daily Rate	Slow	Daily Rate	Fast	Daily Rate	Slow	Daily Rate	Slow	Daily Rate	Fast	Daily Rate	Slow	Daily Rate
	m s	*s*	*m s*	*s*	*m s*	*s*	*m s*	*s*	*m s*	*s*	*m s*	*s*	*m s*	*s*	*m s*	*s*
April 2, noon	1 16.98	G 0.1	0 53	G 1.9	3 0.1	L 2.4	2 32.5	G 4.74			2 52.5	G 0.9	0 01.5	L 1.76	0 17.5	G 1
9	1 17.68		1 0.62		3 17.8		3 05.7		3 02.8		2 46.3		Slow 0 10.8		0 10.3	
		L 1.36		2.4		1.5		4.07		L 5.11		0.7		2.64		1.36
16	1 08.18		1 23.2		3 26.3		3 34.2		3 38.57		2 41.3		0 29.3		0 00.8	
		1.64		1.8		0.7		4.2		7.11		0.86		3.18	Fast	1.7
23	0 56.68		1 35.7		3 31.3		4 03.7		4 28.32		2 35.3		0 51.55		0 10.2	
		2.16		1.27		1.44		3.7		3.44		0.56		3.9		1
30	0 41.58		1 44.6		3 39.4		4 29.6		4 52.42		2 31.4		1 18.9		0 17.1	
		2.7		1.6		G 0.15		3.7		3.24		0.65		2.6		1.7
May 6, midnight	0 25.4		1 56.15		3 39.35		4 55.9		5 11.85		2 26.85		1 37.3		0 28.15	

497 was not received from Mr. Arnold until the middle of the first week in April.

AN ACCOUNT of the going of the Six CHRONOMETERS selected for the determination of Longitudes, from

Week being shewn of each Chronometer

Week ending	228 with					254 with					259 with				
	254	259	369	404	25	228	259	369	404	25	228	254	369	404	25
	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
May 13	G0.61	G2.77	G0.923	L4.96	L7.46	L0.61	G2.16	G0.313	L5.57	L8.07	L2.77	L2.16	L1.747	L7.73	L10.23
20	L1.	3.3	0.86	5.93	9.	G1.	4.3	1.86	4.93	8.	3.3	4.3	2.44	9.23	12.3
27	0.93	2.93	0.57	4.86	9.536	0.93	3.86	1.4	3.93	8.606	2.93	3.86	2.36	7.79	12.466
June 3	1.	2.36	2.036	4.464	10.43	1.	3.36	3.036	3.464	9.43	2.36	3.36	0.324	6.826	12.79
10	0.034	2.8	3.107	3.14	10.61	0.034	2.834	3.141	3.114	10.576	2.8	2.834	G0.307	5.94	13.41
17	G3.11	3.14	2.32	2.57	12.68	L3.11	0.03	L0.79	5.68	15.79	3.14	0.03	L0.82	5.71	15.82
24	4.14	2.7	L0.14	1.535	11.32	4.14	L1.44	4.58	5.675	15.46	2.7	G1.44	2.84	4.235	14.02
July 1	3.7	3.5	0.14	1.07	11.43	3.7	0.2	3.84	4.77	15.13	3.5	0.2	3.64	4.57	14.93
8	3.465	3.68	G0.14	0.714	10.8	3.465	G0.215	3.325	4.179	14.265	3.68	L0.215	3.54	4.394	14.48
15	3.607	4.25	0.714	G0.036	9.964	3.607	0.643	2.893	3.571	13.571	4.25	0.643	3.536	4.214	14.214
22	3.57	4.214	0.357	0.036	9.57	3.57	0.844	3.213	3.534	13.14	4.214	0.844	3.857	4.178	13.784
29	3.07	4.5	0.286	0.107	8.82	3.07	1.43	2.784	2.963	11.89	4.5	1.43	3.214	4.393	13.32
Aug. 5	3.286	4.393	L0.357	0.18	5.18	3.286	1.107	3.643	3.106	8.466	4.393	1.107	4.75	4.213	9.573
12	2.536	4.36	0.57	0.	7.536	2.536	1.824	3.106	2.536	10.072	4.36	1.824	4.93	4.36	11.896
19	3.036	4.464	0.75	0.43	7.82	3.036	1.428	3.786	2.606	10.856	4.464	1.428	5.214	4.034	12.284
26	3.716	4.93	0.536	1.893	5.5	3.716	1.214	4.252	1.823	9.216	4.93	1.214	5.466	3.037	10.43
Sept. 2	3.536	5.93	0.18	2.	4.036	3.536	2.394	3.716	1.536	7.572	5.93	2.394	6.11	3.93	9.966
9	5.07	6.643	G1.036	2.5	3.18	5.07	1.573	4.034	2.57	8.25	6.643	1.573	5.607	4.143	9.823

The "Daily Rates" which are here given, are the actual daily differences of each Chronometer on the others, as shewn on reference is made. A Table of this nature much facilitates the regulation of Chronometers, by bringing into a small compass. It will also generally shew the week in which any Chronometer may change its established rate; and as this sometimes happens on the mean Longitude, which requires to be met by a special correction, this Table serves to fix the periods, and regulate the

the commencement of the Voyage to the close of the season of Navigation of 1819; the average Daily Rate in each successively on the other five.

369 with					404 with					25 with					Temperature.		
228	254	259	404	25	228	254	259	369	25	228	254	259	369	404	Minimum.	Maximum.	Mean
s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	°	°	°
1.923	L0.313	G1.747	L5.886	L8.383	G4.96	G5.57	G7.73	G5.886	L2.5	G7.46	G8.07	G10.23	G8.383	G2.5			
1.86	1.86	2.44	6.79	9.86	5.93	4.93	9.23	6.79	3.57	9.	8.	12.3	9.86	3.07			
1.57	1.4	2.36	5.43	10.106	4.86	3.93	7.79	5.43	4.676	9.536	8.606	12.466	10.106	4.676			
3.036	3.036	0.324	6.5	12.466	4.464	3.464	6.826	6.5	5.966	10.43	9.43	12.79	12.466	5.966			
3.107	3.141	L0.307	6.247	13.717	3.14	3.114	5.94	6.247	7.47	10.61	10.576	13.41	13.717	7.47	45	55	49.5
1.32	G0.79	G0.82	4.89	15.	2.57	5.68	5.71	4.89	10.11	12.68	15.79	15.82	15.	10.11	45	65	54.5
0.14	4.58	2.84	1.395	11.18	1.535	5.675	4.235	1.395	9.785	11.32	15.46	14.02	11.18	9.785	49	68	37.5
0.14	3.84	3.64	0.93	11.29	1.07	4.77	4.57	0.93	10.36	11.43	15.13	14.93	11.29	10.36	46	68	58.7
0.14	3.325	3.54	0.854	10.94	0.714	4.179	4.394	0.854	10.086	10.8	14.265	14.48	10.94	10.086	45	64	60
1.714	3.893	3.536	G0.678	10.678	L0.036	3.571	4.214	0.678	10.	9.964	13.571	14.214	10.678	10.	49	66	56.5
1.357	3.213	3.857	0.321	9.927	0.036	3.534	4.178	0.321	9.606	9.57	13.14	13.784	9.927	9.606	45	66	57
1.286	2.784	3.214	0.179	9.106	0.107	2.963	4.393	0.179	8.927	8.82	11.89	13.32	9.106	8.927	52	66	58.7
0.357	3.643	4.75	0.587	4.823	0.18	3.106	4.213	L0.537	5.36	5.18	8.466	9.573	4.823	5.36	50	66	57.5
0.57	3.106	4.93	0.57	6.966	0.	2.536	4.36	0.57	7.536	7.536	10.072	1.896	6.966	7.536	46	68	58
0.75	3.786	5.214	1.18	7.07	0.43	2.606	4.034	1.18	8.25	7.82	10.856	12.284	7.07	8.25	50	65	58
0.536	4.252	5.466	2.429	4.964	1.893	1.823	3.037	2.429	7.393	5.5	9.216	10.43	4.964	7.393	40	70	57
0.18	3.716	6.11	2.18	3.856	2.	1.536	3.93	2.18	6.036	4.036	7.572	9.966	3.856	6.036	50	69	58.5
1.036	4.034	5.607	1.464	4.216	2.5	2.57	4.143	1.464	5.68	3.18	8.25	9.823	4.216	5.68	48	70	58

their comparison each day at noon; being wholly unconnected with the respective corrections to Mean Greenwich time, to which no need in one view, the means whereby their absolute as well as relative uniformity and steadiness of going may be estimated. in two or three (where several are concerned), in the intervals between comparisons with known time, and as each change has an influence amount of such corrections accordingly.

TABLE III.

AN ACCOUNT of the going of the under-mentioned CHRONOMETERS, on Mean Greenwich Time, (as shown by No. 259, with its correction for Rate and original difference applied,) from the commencement of the Voyage to the close of the Navigation in 1819.

1819	ARNOLD'S 523		ARNOLD'S 2109		PARKINSON AND FRODSHAM'S 253		Temperature		
	Fast	Daily Rate.	Slow.	Daily Rate	Slow	Daily Rate	Max.	Min.	Mean.
	m s	s	m s	s	m s	s			
May 6	1 14.15		1 0		1 37.3				
		G 1.82		G 0.26		L 4.9			
13	1 25.87		0 58.13		2 12.1				
		0.39		L 3.25		4.75			
20	1 28.64		1 20.86		2 45.36				
		2.25		4.3		6.5			
27	1 44.4		1 51.1		3 30.84				
		8.1		4.9		8.3			
June 3	2 41.2		2 25.8		4 21.8				
		6		3.6		7	55	45	49.5
10	3 23.2		2 51.3		5 17.8				
		4.9		2.8		8.7	65	45	54.5
17	3 57.2		3 10.8		8 18.8				
		2.8		3.9		26.5	68	49	57.5
24	4 16.75		3 38		11 24				
	Slow			5.24		27	68	46	58.7
July 1	17 26.7		4 14.7		14 33.2				
		4.24		3.7		29.6	64	45	60.2
8	16 57		4 40.9		17 53.9				
		1.6		2.4		29	66	49	56.5
15	16 45.7		4 57.7		21 16.7				
		L 2.1		2.7		29.4	66	45	57
22	17 00.4		5 16.8		24 42.9				
		0.1		1.6		27.6	66	52	58.7
29	17 01.2		5 28.1		27 56.15				
		2.1		2.86		30.9	66	50	57.5
Aug. 5	17 15.9		5 48.15		31 32.65				
		2.5		2.7		28	68	46	58.7
12	17 33.85		6 07.35		34 48.85				
		2.5		1.4		28.6	66	50	58
19	17 51.3		6 17.3		38 09				
		4.8		2.6		29.1	70	40	57
26	18 25.1		6 33.6		41 33.1				
		2.8		1.46		28.6	69	50	58.5
Sept. 2	18 44.8		6 43.8		44 53				
		6		2.5		29.5	70	48	58
9	19 28.8		7 01.5		48 19.5				

No. 523 was worn in the pocket during the whole of the above period; it was stopped on the 30th of June, by being drawn out too quickly in noting the time of an observation.

TABLE IV.

AN ACCOUNT of the going of the HECLA's CHRONOMETERS on Mean Time at Winter Harbour, fro

DATE.	No. 259		No. 228		No. 253		No. 254		No. 369		No. 404		No. 25		No.
	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast
1819	m s	s	m s	s	m s	s	m s	s	m s	s	m s	s	m s	s	m s
Sept. 30	12 43.66	L 3.89	21 42.16	G 3.5	24 41.16	L 32	18 33.66	L 2.8	23 46.6	L 5.14	30 12	L 1.21	37 14	L 37	43 27
Oct. 7	12 16.43	3.89	22 06.93	3.61	20 56.93	32.9	18 13.9	2.6	23 10.6	2.14	30 03.5	0.8	32 55	32.3	41 56
14	11 49.2	3.01	22 32.2	4.13	17 06.45	31.6	17 57	2.1	22 55.5	0.6	29 57.9	0.04	29 09	39	40 19
21	11 28.1	3.01	23 01.1	4.13	13 25.1	30.4	17 42.5	1.8	22 51.6	G 0.43	29 57.6	G 0.34	24 36	45.3	39 01
28	11 07	3.95	23 30	3.08	9 52.5	30.6	17 30	1.14	22 54.5	L 0.7	30 0	L 1	19 19	34	4 34
Nov. 4	10 39.3	3.95	23 51.5	2.76	6 18	32.6	17 22	3.6	22 49.5	G 0.07	29 53	0.8	10 43	38	3 10
11	10 11.6	3.95	24 10.8	2.96	2 29.85	28.6	16 57.3	3	22 50	L 1.43	29 47.5	0.61	06 17.3	27	1 30
18	09 44	3.95	24 31.5	4.97	59 09.5	32.4	16 36.5	5	22 40	.....	29 43.2	3.7	03 07.5	.....	0 09
25	09 16.3	3.95	25 06.3	3.47	55 22	30	16 01.6	3.1	35 44	L 4.1	29 17	2.4	Stopt	.....	59 26
Dec. 2	08 48.6	3.5	25 30.6	3.6	51 52.1	29.7	15 40	2.3	35 14.9	7.3	29 0	G 0.14	15 00	17	56 19
9	08 24	3.5	25 55.75	3.4	48 23.7	28.3	15 23.75	0.86	34 53.75	2.8	29 01	L 0.9	13 01	03.3	54 57.5
16	07 59.5	3.5	26 20	3.9	45 05	28.6	15 18	0.8	34 04.25	2.1	28 54.5	1.6	12 38	2.4	53 27
23	07 35	.....	26 47.25	2.67	41 45	31.3	15 12.5	2.7	33 49.75	7.2	28 43.2	3.4	12 20.75	21	51 34.5
30	38 36.7	3.6	27 05.95	4.8	38 06	29.1	14 55.6	0.3	32 59.4	4.2	28 19.4	1.3	9 52	11	48 3
1820 Jan. 6	38 11.5	3.6	27 39.5	4.8	34 42	30.5	14 53.75	1.46	32 30.2	6.9	28 10.5	3	8 35.5	63.6	46 34
13	37 46.3	3.6	28 13	.....	31 08.8	30.1	14 43.5	0.7	31 42	6.1	27 49.3	2.2	1 10.5	37	44 05.3
20	37 21.1	3.7	44 44	5.46	27 38	30.14	14 38.6	0.84	30 59	3.7	27 33.8	1.97	56 50.6	21.9	41 30.6
27	36 55.2	3.7	45 12.25	3.5	24 07	30.4	14 32.7	1.27	30 33	5.1	27 20	2.4	54 17	30.6	37 38.2
Feb. 3	36 29.3	3.7	45 37.6	3.9	20 34	29.66	14 23.8	1.24	29 57	6.6	27 03	2.1	50 42.8	18	34 05.8
10	36 03.4	3.7	46 04.9	5.66	17 06.4	30.13	14 15.1	1.1	29 11	.....	26 48.4	4.7	48 35.4	.....	30 55.4
17	35 37.5	G 0.5	46 44.5	17	13 35.5	29.4	14 07.5	3.9	Stopt	.....	26 15.5	.....	Stopt	.....	27 07.5
24	35 41	0.5	48 43.75	20.1	10 09.2	30	13 40	8.3	.....	.....	Stopt	.....	.....	.....	22 51
March 2	35 44.5	0.5	51 04.5	14.8	6 39.5	29.3	12 42	2.8	.....	.....	.....	.....	.....	.....	17 27.5
9	35 48	L 1.4	52 48	5.7	3 14	29.7	12 22.5	1.43	10 32.5	L 7.36	49 34	2.7	41 43	52.1	14 29
16	35 38.2	1.4	53 28	7.06	59 46.4	31.4	12 12.5	3.1	9 41	7.3	49 15	.....	35 38.2	60.4	9 40
23	35 28.4	1.4	54 17.4	7.8	56 07	29.7	11 50.6	2.76	8 50	8.6	Stopt	.....	28 35	54	4 44.5
30	35 18.6	1.4	55 12	7.26	52 39.1	30.7	11 31.3	2.3	7 47.6	11.5	.....	.....	22 18.6	48	0 36
April 6	35 08.8	1.5	56 02.2	7.8	49 03.8	33.2	11 15	3.44	6 27.3	10.1	.....	.....	16 45	23	56 19
13	34 58.4	1.5	56 57.4	10.4	45 11.4	32.3	10 50.9	4.9	5 16	11.4	.....	.....	13 30	20.4	50 53
20	34 48	1.5	58 10	7.64	41 25	30.9	10 16.5	3.2	3 56.3	4.1	.....	.....	11 07	31.7	47 12
27	84 37.5		59 03.5		37 48.5		9 54		3 27.5		.....	.....	7 25.5		43 37.5

GOING OF THE CHRONOMETERS.

TABLE V.

HRONOMETERS on Mean Time, at Winter Harbour, during the Twelve Weeks preceding the season of Navigation of 1820.

	PARKINSON AND FRODSHAM'S										Temperature	
No. 25		No. 2109		No. 253		No. 254		No. 259		No. 228			
Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Fast	Daily Rate	Maximum	Minimum
m s	*s*	*m s*	*s*	*h m s*	*s*	*h m s*	*s*	*h m s*	*s*	*h m s*	*s*	°	°
. . . .		59 12.5		6 32 09		7 8 58.5		. . . . .		4 00 06			
	. . .		L 12.1		L 30.2		L 4		. . .		G 6.86	47	26
. . . .		57 47.5		28 37.6		8 30.3		. . . . .		00 54			
	. . .		12.4		28.4		2.23		. . .		6.34	53	36
. . . .		56 20.7		25 18.7		8 14.7		6 34 11.7		1 38.2			
	. . .		12.9		25.7		0.7		G0.82		5	56	42
37 50		54 40.7		22 18		8 10		34 17.4		2 13.4			
	L 10.7		. . .		25		3.3		1.42		4.7	59	45
36 35		. . . .		19 24.4		7 46.4		34 27.3		2 46.55			
	7.9		. . .		29.3		1.16		1.41		6.8	53	43
35 40		. . . .		15 58.9		7 38.6		34 54.4		3 34			
	8.4		. . .		28.3		3.2		1.415		5.3	53	41
34 41		38 30.3		12 40.8		7 16.3		35 04.3		4 11			
	4.7		12.7		27.7		2.2		0.857		5.1	57	41
33 08		37 01.5		9 27		7 01		35 10.34		4 47			
	5.4		9.3		27.1		1.4		1.21		5.8	58	46
32 30.3		35 56.3		6 17.6		6 51.8		35 18.8		5 28.5			
	G 9.1		9.86		27.6		1		1.51		5.8	57	49
33 34		34 47		3 04		6 44.3		35 29.3		6 09.3			
	10.3		9.1		26.6		0.66		1.344		6.6	58	48
34 46.2		33 43.2		5 59 58.25		6 39.7		35 38.75		6 55.7			
	13		8.7		27.6		1.8		1.08		5.2	55	48
36 17.3		39 42		56 45.5		6 27		35 46.3		7 32			
	13.5		6.7		28		2.1		1.414		5.8	54	48
37 51.8		31 55		53 30.1		6 11.9		35 56.3		8 13			
		Losing 10.42		Losing 27.62		Losing 1.98		Gaining 1.25		Gaining 5.775			

No. 523 also omitted, since being much in use as a pocket watch it was not regularly compared. No. 2109 was worn by Captain , from the 1st to the 15th of June. Nos. 367, 377, and 497, were the Griper's establishment, and were returned to her on the y a Transit Instrument at the Observatory.

TABLE VI.

AN ACCOUNT of the going of Nos. 228, 253, 254, 259, and 2109, from the commencement to the close of the Season of Navigation of 1820; the Average daily Rate in each week being shewn of each Chronometer successively on the other four.

Week ending	228 with				253 with				254 with				259 with				2109 with			
	253	254	259	2109	228	254	259	2109	228	253	259	2109	228	253	254	2109	228	253	254	259
	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s
Aug. 7	G 35.48	G 9.59	G 5.4	G 19	L 35 48	L 25.89	L 30.08	L 16.48	L 9.59	G 25.89	L 4.19	G 9.41	L 5.4	G 30.08	G 4.19	G 13.6	L 19	G 16.48	L 9.41	L 13.6
14	35.46	9.78	6.39	18.99	35.46	25.68	29.07	16.47	9.78	25.68	3.39	9.21	6.39	29.07	3.39	12.6	18.99	16.47	9.21	12.6
21	35.79	11.14	6.18	19.36	35.79	24.65	29.61	16.43	11.14	24.65	4.96	8.22	6.18	29.61	4.96	13.18	19.36	16.43	8.22	13.18
28	37.57	13.25	7.71	21.03	37.57	24.32	29.86	16.54	13.25	24.32	5.54	7.78	7.71	29.86	5.54	13.32	21.03	16.54	7.78	13.32
Sept. 4	32.89	9.89	3.89	16.1	32.89	23	29	16.79	9.89	23	6	6.21	3.89	29	6	12.21	16.1	16.79	6.21	12.21
11	32.19	8.59	4.89	16.25	32.19	23.6	27.3	15.94	8.59	23.6	3.7	7.66	4.89	27.3	3.7	11.36	16.25	15.94	7.66	11.36
18	33.06	7.06	4.36	17.06	33.06	26	28.7	16	7.06	26	2.7	10	4.36	28.7	2.7	12.7	17.06	16	10	12.7
25	33.97	7.75	4.61	16.97	33.97	26.22	29.36	17	7.75	26.22	3.14	9.22	4.61	29.36	3.14	12.36	16.97	17	9.22	12.36
Oct. 2	34.61	8.04	3.68	17.36	34.61	26.57	30.93	17.25	8.04	26.57	4.36	9.32	3.68	30.93	4.36	13.68	17.36	17.25	9.32	13.68
9	33.86	7.39	4.43	18.73	33.86	26.47	29.43	15.13	9	26.47	2.96	11.34	4.43	29.43	2.96	14.3	18.73	15.13	11.34	14.3
16	33.8	7.79	4.54	18.77	33.8	26.01	29.26	15.03	7.79	26.01	3.25	10.98	4.54	29.26	3.25	14.23	18.77	15.03	10.98	14.23
23	34.07	7.87	4.17	17.54	34.07	26.2	29.9	16.53	7.87	26.2	3.7	9.67	4.17	29.9	3.7	13.37	17.54	16.53	9.67	13.37
30	32.83	6.46	4.03	17.13	32.83	25.37	28.8	15.7	6.46	25.37	2.43	10.67	4.03	28.8	2.43	13.1	17.13	15.7	10.67	13.1
Nov. 6	34.65	8.22	3.75	18.61	34.65	25.43	30.9	16.04	8.22	25.43	4.47	10.39	3.75	30.9	4.47	14.86	18.61	16.04	10.39	14.86
13	34.03	9.43	3.43	18.03	34.03	24.6	30.6	16	9.43	24.6	6	8.6	3.43	30.6	6	14.6	18.03	16	8.6	14.6

TABLE VII.

A STATEMENT of the Daily Rates of the under-mentioned CHRONOMETERS in London, since their return from the Expedition.

1820	ARNOLD'S					PARKINSON and FRODSHAM'S			
	367	377	497	2109	25	228	253	254	259
	s	s	s	s	s	s	s	s	s
Dec. 3	. . .	. . .	. . .	. . .	. . .	G 7	L 29	L 3	G 3.5
4	. . .	. . .	. . .	. . .	. . .	5.5	28.5	3	3
5	. . .	. . .	. . .	. . .	. . .	6.5	27.5	3	3
6	. . .	. . .	. . .	. . .	. . .	6	27	1.5	1.5
7	. . .	. . .	. . .	. . .	. . .	6.5	26	2	2.5
8	. . .	. . .	. . .	. . .	. . .	5.5	27.5	2	2.5
9	L 7	L 6	G 6	L 11	G 12	6	27.5	2	2
10	9.5	6	8	12	14	6	27	3	1.5
11	8.5	5	9.3	11	14.7	6	27	2	2
12	8.5	5	7	11	12.5	6	26	2	1.5
13	9	4	8	12	14.5	5.5	27	2.5	1.5
14	8	4	8	11	13	6	28	3.5	1.5
15	9.5	6	7	12	14	6.5	28	4	2.5
16	9.5	6.5	. . .	12	13	7	28	3.5	3
17	. . .	. . .	. . .	. . .	. . .	6.5	29	3.5	2.5
18	. . .	. . .	. . .	. . .	. . .	6	29	3	2.5
Mean	L 8.7	L 5.3	G 7.6	L 11.5	G 13.5	G 6.2	L 27.6	L 2.7	G 2.28

APPENDIX II.

LUNAR OBSERVATIONS.

ASIATIC SOCIETY MUMBAI

Nº II.

LUNAR OBSERVATIONS.

THE lunar observations comprised in this Abstract, are those by which the chronometers selected for the determination of longitude were regulated.

The method, by which their results were applied from time to time to this purpose, is explained in the notes and memorandums annexed to the dates to which they respectively belong.

The observations were made by Captain Parry, and Lieutenant Beechey, Messrs. Hooper and Ross, and Captain Sabine; who are severally referred to by their initials in the column denoting the observer.

The instruments used in observing the distances were generally sextants, and occasionally reflecting circles; when sextants were employed, their index error was always carefully ascertained at the time of observation; the distances observed with circles are distinguished by asterisks, and those with sextants are corrected for the index error.

The apparent altitudes of the objects were usually obtained by proportion from observations at the commencement and close of each set of distances; when circumstances did not permit the observation, they have been calculated.

The distances of the four first-mentioned observers have been cleared from the effects of parallax and refraction by Dr. Maskelyne's rule, published in the preface to Taylor's Logarithms, using the table of mean refraction of Mendoza Rios corrected for variations in temperature and atmospherical pressure. The true distances of Captain Sabine have been computed sometimes by the same method, but oftener by the Cambridge Parallactic Tables.

In ascertaining the apparent time at Greenwich corresponding to the true distances, the first term of the proportion, being usually the difference between the next greater and the next less distance in the Nautical Almanac, has been corrected when necessary, by the method of second differences, to the actual change in the moon's distance from the sun or star in the interval of three hours, of which the middle point is intermediate between the time of the observation, and that of the computed distance in the Almanac, to which the portion of time sought is to be applied.

NOTE.—The dates throughout this abstract are according to the astronomical method of reckoning; the times by watch, and the apparent Greenwich times, being carried on beyond twenty-four hours when necessary in longitudes west of Greenwich.

ASIATIC SOCIETY

LUNAR OBSERVATIONS AT SEA, 1819.

	Time by 228	Observed distance of Limbs	Apparent Altitudes		Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	228 on mean Greenwich time	Phænomena
			Moon's centre	Sun's centre, or Star								
	h m s	° ′ ″	° ′ ″	° ′ ″			*In.*	°	° ′ ″	*h m s*	*m s*	
June 5	12 50 53.9	79 33 41	15 55 46	20 50 37	P	10	29.6	42	79 01 02	12 55 19	Slow 2 28.4	☽ From α Aquilæ East.
„	13 12 19.2	79 27 02	15 12 50	23 49 47	B	3	29.7	43	78 51 26	13 15 22.7	1 07.5	„
„	13 19 05.5	79 23 47.5	14 53 45	24 44 38	S	7	29.8	44	78 47 25	13 23 46	2 41.9	„
„	13 46 11.7	79 13 53	13 29 10	28 16 00	S	7	29.8	44	78 34 10	13 51 17	3 08.3	„
„	14 18 55.1	79 02 27	11 23 40	32 03 57	P	8	29.6	43	78 19 21.2	14 22 05.8	1 14.7	„
										Mean.....	2 08.16	„

By the allowance for rate and original difference, 228 was slow of mean Greenwich time at midnight on the 5th June 2ᵐ 44ˢ.2, making 36ˢ.04 less Greenwich time than resulted from the lunar distances: or the lunar longitude 9′ 01″ west of the longitude by 228, and 3′ 51″ west of the mean of the six chromometers.

LUNAR OBSERVATIONS AT SEA—June 26th to July 1st inclusive.

1819	Time by 228	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	228 on mean Greenwich time	Phænomena
	h m s	° ′ ″	° ′ ″	° ′ ″			*Ins.*	°	° ′ ″	*h m s*	*m s*	
June 26	8 53 06.6	46 06 53	41 21 34	28 56 06	P	7	29.6	33	46 36 36	8 54 55.8	Slow 4 08.8	☽ From Sun West
,,	8 58 51.8	46 09 18	41 01 55	28 18 21	P	7	29.6	33	46 39 31	9 01 24.3	4 52.1	,,
,,	9 09 35.5	46 12 31.4	40 35 50	27 08 03	S	7	29.6	32	46 43 39.5	9 10 36	3 20.5	,,
,,	9 17 17.3	46 15 39.8	40 01 20	26 17 40	S	8	29.6	32	46 47 27.8	9 19 02.5	4 05.2	,,
,,	9 20 42.6	46 17 27	39 52 33	25 55 45	H	10	29.6	32	46 49 29	9 23 32	5 09.8	,,
,,	9 26 59.3	46 19 24	39 26 47	25 14 30	H	9	29.6	32	46 51 55.4	9 28 56	4 16.5	,,
,,	9 31 31.8	46 21 02	39 16 50	24 46 0	S	10	29.6	32	46 54 05	9 33 34	4 32.2	,,
,,	9 42 55.8	46 25 28.8	38 18 40	23 29 0	S	10	29.6	32	46 59 18.8	9 45 20.5	4 44.7	,,
,,	9 47 25.4	46 25 58.2	37 57 52	22 59 56	B	10	29.6	32	47 00 08	9 47 09.4	2 04.2	,,
,,	9 54 11.6	46 28 46.3	37 23 49	22 15 47	B	10	29.6	32	47 03 23	9 54 22	2 30.4	,,
,,	10 37 12.5	46 46 25	33 39 00	17 40 19	R	7	29.6	32	47 23 57.5	10 39 59.5	5 07.5	,,
,,	10 49 24.8	46 51 13	32 31 00	16 23 0	S	6	29.6	32	47 29 35	10 52 28.5	5 23.7	,,
,,	10 56 31.5	46 53 50.2	31 50 00	15 41 0	S	6	29.6	32	47 32 38.8	10 59 17	5 05.5	,,
27	8 39 07.8	57 00 52	39 07 24	30 33 0	S	6	29.4	34	57 21 58.3	8 40 27.5	3 51.7	,,
,,	8 46 02.2	57 03 17.7	38 57 00	29 47 30	S	6	29.4	34	57 25 03	8 47 10	3 40	,,
,,	8 47 55.1	57 04 24	38 55 53	29 35 09	P	7	29.4	34	57 26 22.8	8 50 04.8	4 41.9	,,
,,	8 52 13.7	57 06 23	38 51 04	29 06 40	P	7	29.4	34	57 28 00.4	8 53 40.8	3 59.3	,,
,,	8 56 17.8	57 07 07	38 45 03	28 39 56	P	7	29.4	34	57 29 54.4	8 57 51.2	4 05.6	,,
,,	9 01 41.3	57 09 08.3	38 29 00	28 04 30	S	6	29.4	34	57 32 12.6	9 02 54.5	3 45.2	,,
,,	9 11 45	57 13 41.3	38 05 30	26 57 40	S	7	29.4	34	57 36 48.8	9 13 00.5	3 47.5	,,
,,	9 14 54	57 14 36	37 58 05	26 36 56	H	6	29.4	34	57 38 57	9 17 43.5	5 21.8	,,
,,	9 20 35.6	57 16 44	37 43 54	25 59 14	H	5	29.4	34	57 41 36	9 23 32.6	5 29.4	,,
,,	9 37 45.6	57 21 56.4	36 59 28	24 05 23	B	10	29.4	34	57 48 22	9 38 23.5	3 10.3	,,
,,	9 42 42.7	57 23 53.9	36 43 00	23 32 48	B	10	29.4	34	57 50 46	9 43 40	3 30.8	,,
,,	10 00 24.7	57 31 40	35 17 20	21 36 38	R	10	29.4	34	57 59 52	10 03 35	5 42.3	,,
28	5 25 11.5	66 53 42	24 39 10	47 41 47	R	7	29.4	36	66 51 58	5 24 48.5	2 20	,,

„	5 30 44	66 56 21	25 07 09	47 24 19	H	5	29.4	36	66 54 44.5	5 30 49.5	2 48.2	„
„	5 36 46.3	66 58 23	25 37 33	47 04 39	H	5	29.4	36	66 57 15	5 36 14.4	2 11	„
„	5 42 33	67 01 15	26 06 40	46 45 0	S	8	29.4	35	67 00 33.5	5 43 24	3 34	„
„	5 44 42.5	67 01 27	26 14 54	46 36 43	R	10	29.4	36	67 00 49	5 44 03	2 03.5	„
„	5 52 24	67 05 00.3	26 54 30	46 08 40	S	6	29.4	35	67 04 58.3	5 52 58	3 17	„
„	5 54 34.2	67 05 24	27 03 28	45 59 11	H	6	29.4	36	67 05 28.7	5 54 03.5	2 12.4	„
30	6 57 01.3	90 17 48	14 25 44	41 05 46	H	6	29.8	37	90 14 50.4	6 58 35	4 41.7	„
„	7 03 43.6	90 20 07	14 57 00	40 31 07	P	7	29.8	38	90 17 31	7 04 05.8	3 30.6	„
„	7 07 30.3	90 21 54	15 14 02	40 07 42	P	7	29.8	38	90 19 33	7 08 17.8	3 55.9	„
„	7 11 04.2	90 23 27	15 29 50	39 47 23	P	7	29.8	38	90 21 16	7 11 50.6	3 54.8	„
„	7 14 32.7	90 24 52	15 45 20	39 27 21	P	7	29.8	38	90 22 52.8	7 15 09.6	3 45.4	„
„	7 25 25	90 28 46	16 32 15	38 23 03	H	9	29.8	38	90 27 22.3	7 24 26	2 09.2	„
„	7 26 48.7	90 30 13	16 37 18	38 15 12	P	7	29.8	38	90 28 59	7 27 45.8	4 05.7	„
„	7 29 45.8	90 31 20	16 48 47	37 57 30	P	7	29.8	38	90 30 17	7 30 26.7	3 49.9	„
„	7 31 58.3	90 31 41	16 58 25	37 43 59	H	7	29.8	38	90 30 44	7 31 21.5	2 31.5	„
„	7 32 01.5	90 32 23	16 58 36	37 43 47	P	7	29.8	38	90 31 30	7 32 56.4	4 03.6	„
„	7 34 28.4	90 33 19	17 08 33	37 28 56	P	7	29.8	38	90 32 33.6	7 35 07.7	3 48	„
„	7 36 56.5	90 34 33	17 18 02	37 14 00	P	7	29.8	38	90 33 55.6	7 37 52.2	4 09.4	„
„	7 39 41.1	90 35 44	17 28 45	36 57 09	P	7	29.8	38	90 35 27	7 41 01.7	4 29.3	„
„	7 42 08.8	90 36 14.1	17 38 25	36 41 0	S	10	29.8	38	90 36 06.3	7 42 28	3 27.5	„
„	7 42 13.6	90 36 37	17 38 41	36 41 31	P	7	29.8	38	90 36 23	7 42 59.2	3 54.4	„
„	7 45 02.6	90 37 58	17 49 07	36 24 05	P	7	29.8	38	90 37 55.8	7 46 10	4 16.2	„
„	7 47 01.6	90 38 38	17 56 43	36 11 47	P	7	29.8	38	90 38 41	7 47 43.8	3 51	„
„	7 51 41.5	90 40 31	18 12 10	35 42 35	R	10	29.8	38	90 40 58	7 52 28.5	3 55.5	„
„	7 56 15.5	90 42 23	18 28 45	35 13 42	R	10	29.8	38	90 43 09	7 56 59.5	3 52.5	„
„	8 06 21.5	90 46 15	19 04 21	34 09 31	B	5	29.8	38	90 47 45.2	8 06 46	3 14	„
„	8 06 30.8	90 45 46	19 04 11	34 08 05	H	6	29.8	38	90 47 17.2	8 05 30.7	2 08.4	„
„	8 09 20.6	90 47 26	19 16 27	33 50 11	B	5	29.8	38	90 49 00	8 09 01.3	2 49.1	„
„	8 12 06	90 48 31	19 26 28	33 32 36	B	5	29.8	38	90 50 27.6	8 12 02	3 04.4	„
„	8 13 48.9	90 48 50	19 32 25	33 21 05	B	3	29.8	38	90 51 22.5	8 13 55.2	3 14.8	„
„	8 20 18.6	90 52 14.6	19 46 10	32 38 20	S	9	29.8	37	90 54 59.3	8 21 21.5	4 11.2	„
„	8 29 18.4	90 55 31.4	20 11 30	31 39 30	S	10	29.8	37	90 59 09.3	8 29 56	3 46.4	„

LUNAR OBSERVATIONS AT SEA, June 26th to 1st July inclusive, *continued.*

1819	Time by 228	Observed distance of Limbs	Apparent Altitudes. Moon's centre	Apparent Altitudes. Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	228 on mean Greenwich time	Phænomena
	H M S	° ′ ″	° ′ ″	° ′ ″			IN	°	° ′ ″	H M S	M S	
June 30	8 40 13.9	91 00 10	20 37 57	30 28 02	H	8	29.8	38	91 04 25.8	8 40 59.2	slow 3 45.1	☽ From Sun, west
„	8 44 49.1	91 01 56	20 48 34	29 57 40	H	7	29.8	38	91 06 36.3	8 45 19.6	3 39.4	✶ „
„	8 51 15.8	91 04 27.7	21 04 00	29 14 00	S	10	29.8	38	91 09 47.8	8 51 51.5	3 44.5	„
„	9 00 14.6	91 07 52.5	21 21 30	28 14 30	S	10	29.8	38	91 14 01.3	9 00 33	3 27.2	„
„	9 06 19.5	91 10 34	21 30 59	27 34 37	R	10	29.8	38	91 17 08.5	9 06 59	3 48.5	„
„	9 09 29.9	91 11 58	21 36 28	27 13 0	H	10	29.8	38	91 18 09.9	9 09 27	3 06.2	„
„	9 09 56.5	91 12 20	21 36 51	27 09 51	R	10	29.8	38	91 19 15	9 11 20.6	4 32.6	„
„	10 47 22.9	91 49 02.7	21 45 45	16 30 40	S	10	29.8	38	92 05 35	10 46 36	2 23	„
„	11 00 09	91 54 58	21 25 15	15 09 57	R	10	29.8	38	92 12 36	11 01 01.5	4 01	„
„	11 09 53	91 59 02	21 06 41	14 10 03	R	10	29.8	38	92 17 32	11 11 09	4 26	„
July 1	8 26 25	102 45 53	11 25 26	30 48 50	B	10	29.8	38	102 47 50.8	8 27 11	4 06.4	„
„	8 36 04	102 49 55	11 58 28	29 38 36	P	10	29.8	38	102 52 51.4	8 37 10	4 26.4	„
„	8 42 21.75	102 52 05.7	12 21 20	29 04 00	S	10	29.8	38	102 55 18.7	8 42 03	3 02	„
„	8 43 44	102 53 07	12 22 07	28 57 30	B	10	29.8	38	102 56 20	8 44 05	3 41.5	„
„	8 54 18	102 57 45	12 49 34	27 49 02	R	10	29.8	38	103 01 42	8 54 46.5	3 45.5	„
„	9 12 02	103 04 41.4	13 34 0	25 53 0	S	10	29.8	38	103 10 07.5	9 11 34.7	2 53.5	„
„	9 20 53.1	103 09 12	13 48 29	24 56 40	B	10	29.8	38	103 15 04	9 21 25.5	3 53.3	„
„	9 31 59.6	103 12 56	14 12 30	23 44 0	S	10	29.8	38	103 20 04.6	9 31 22	2 43.2	„
„	9 36 00.5	103 15 26	14 15 36	22 39 11	P	10	29.8	38	103 22 32	9 36 18.3	3 38.7	„
„	9 48 45.6	103 20 45	14 31 26	21 56 0	P	10	29.8	38	103 29 12	9 49 35	4 10.4	„
„	9 51 21	103 21 21	14 36 31	21 42 27	R	10	29.9	38	103 30 08	9 51 45.5	3 41.5	„
„	10 20 01.6	103 32 49	14 58 0	18 42 09	H	10	29.9	38	103 44 07.2	10 19 06.1	2 38.5	„

June 26th to July 1st inclusive; 640 distances; 228 slow of mean Greenwich time, 3m 44s.35. This result is carried to account in the regulation of the chronometers, in a memorandum annexed to the observations of August.

LUNAR OBSERVATIONS AT SEA—August 12th to 15th inclusive.

1819	Time by 228	Observed distance of Limbs	Apparent Altitudes		Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	228 on mean Greenwich time	Phænomena
			Moon's centre	Sun's centre, or Star								
	H M S	° ′ ″	° ′ ″	° ′ ″			IN	°	° ′ ″	H M S	H M	
Aug. 12	14 37 57.2	85 26 25	8 03 01	4 11 42	P	5	29.8	33	85 56 06.6	14 35 48.8	Slow 2 36.4	☽ from Sun set
,,	14 42 26.5	85 23 29.9	8 15 20	3 57 30	S	6	29.8	33	85 53 36	14 40 56	3 14.2	,,
,,	14 44 15.8	85 22 25	8 20 42	3 52 09	B	7	29.8	33	85 52 42	14 42 51.1	3 20.1	,,
,,	14 51 33.9	85 18 28.5	8 41 52	3 28 29	S	6	29.8	33	85 49 17.5	14 49 58	3 09	,,
,,	14 56 48.7	85 16 09	8 56 30	3 15 36	H	7	29.8	33	85 47 24.8	14 53 48	1 43.9	,,
,,	14 59 18	85 14 41	9 03 56	3 05 53	R	7	29.8	33	85 45 46	14 57 12	2 37	,,
,,	14 59 46.3	85 13 47.9	9 05 32	3 05 23	S	5	29.8	33	85 45 13.9	14 58 18	3 16.4	,,
,,	15 10 34.6	85 07 50	9 39 07	2 36 09	P	8	29.8	33	85 40 24	15 08 19.5	2 29.5	,,
,,	24 44 35.8	80 43 22	39 15 46	17 33 19	P	7	29.8	37	81 05 16	24 41 48.8	1 53.6	,,
,,	24 51 28	80 40 28.5	39 10 30	18 02 33	P	7	29.8	37	81 01 36.6	24 49 34	2 45.6	,,
,,	25 04 20	80 34 48.2	39 03 30	18 57 30	S	7	29.8	35	80 55 23.5	25 02 30	2 50.3	,,
,,	25 12 51.8	80 31 15.2	38 56 30	19 33 30	S	7	29.8	35	80 51 14.5	27 11 11	2 59.5	,,
,,	25 25 50.8	80 26 05.8	38 41 23	20 26 28	B	7	29.8	38	80 45 06	25 24 04.7	2 54.4	,,
,,	25 28 41.3	80 24 56.3	38 37 37	20 39 25	B	3	29.8	38	80 43 44.6	25 26 55.5	2 54.7	,,
,,	29 25 10.5	78 43 15.9	26 18 0	31 24 30	S	8	29.7	35	78 51 19.7	29 23 11	2 39	,,
,,	29 37 55	78 37 32.5	25 28 30	31 32 0	S	8	29.7	35	78 45 23.4	29 35 41	2 24.5	,,
13	10 12 38.6	76 19 57	10 03 03	21 39 06	H	7	29.8	38	76 34 24.5	10 12 10.4	4 08.3	,,
,,	10 21 55.5	76 15 33	9 43 24	21 01 33	R	12	29.8	40	76 30 30	10 20 29	3 10	,,
,,	10 24 51	76 14 30	9 37 54	20 47 50	B	6	29.8	38	76 29 42	10 22 11.5	1 57.1	,,
,,	10 25 05.3	76 13 37.5	9 37 26	20 46 35	H	5	29.8	38	76 28 48.3	10 24 01	3 32.1	,,
,,	10 40 24.5	76 05 51	9 09 57	19 38 55	R	10	29.8	38	76 21 57.4	10 38 34.5	2 46.5	,,
,,	24 48 26.6	69 14 54	42 01 06	17 33 00	R	10	29.7	36	69 43 55.5	24 46 52	2 55.5	,,
,,	24 48 47.6	69 14 52.5	42 09 50	17 33 50	S	7	29.7	35	69 44 01.3	24 46 40.5	2 23.1	,,
,,	25 18 10	69 08 13	42 13 58	19 34 52	P	8	29.7	36	69 30 13	25 16 17.3	2 37.4	,,
,,	25 21 47.5	69 01 25	42 08 55	19 51 37	R	10	29.7	36	69 28 11	25 20 39	3 21.5	,,
,,	25 30 34.8	68 58 35	42 08 04	20 25 32	B	6	29.7	37	69 24 41	25 28 10.75	2 05.8	,,
,,	25 37 09.5	68 55 24	42 00 26	20 52 24	R	10	29.7	36	69 21 09.5	25 35 43	3 03.5	,,

LUNAR OBSERVATIONS AT SEA—August 12th to 15th inclusive, *continued.*

1819	Time by 228	Observed distance of Limbs	Apparent Altitudes		Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich Time	228 on mean Greenwich time	Phænomena
			Moon's centre	Sun's centre, or Star								
	H M S	° ′ ″	° ′ ″	° ′ ″			IN	°	° ′ ″	H M S	M S	
Aug. 13	25 41 32.2	68 54 14	42 04 06	21 09 29	P	7	29.7	36	69 19 40.4	25 38 57.1	Slow 1 55.1	D from Sun east
,,	25 46 21.4	68 52 01.2	41 55 0	21 28 42	S	7	29.7	35	69 17 13.8	24 44 08	2 10.4	,,
,,	25 48 15.6	68 51 01.6	41 56 13	21 35 43	B	7	29.7	37	69 15 55.2	25 46 59	3 13.2	,,
,,	25 55 46.4	68 48 20	41 48 22	22 07 55	P	7	29.7	36	69 12 46	25 53 44.5	2 27.9	,,
,,	26 04 12.15	68 44 45	41 38 57	22 36 15	B	6	29.7	37	69 08 36	26 02 42.5	3 00.04	,,
,,	26 13 48.6	68 40 44.6	41 27 20	23 11 50	S	8	29.7	35	69 04 10.6	26 12 11	2 57.1	,,
,,	26 14 10.9	68 40 54	41 26 58	23 13 44	P	9	29.7	37	69 04 12	26 12 09	2 27.8	,,
,,	26 22 09.9	68 37 23	41 17 08	23 42 33	B	9	29.7	37	69 00 08	26 20 52.2	3 11.9	,,
,,	26 22 38.5	68 37 15	41 12 59	23 45 06	R	10	29.7	36	69 00 06	26 30 55.8	2 27	,,
,,	27 38 39.2	68 06 11	38 24 41	27 44 48	H	10	29.8	38	68 24 30.4	27 37 25.2	3 15	,,
,,	27 38 56.2	68 06 40	38 24 01	27 45 54	P	9	29.7	36	68 25 11.8	27 35 56.2	1 29.2	,,
,,	27 45 13.8	68 03 57	38 05 51	28 02 25	H	10	29.8	38	68 21 20.6	27 44 13.5	3 28.6	,,
,,	27 47 12	68 02 47	37 59 42	28 06 50	S	7	29.7	36	68 20 46	27 45 27	2 24	,,
,,	27 48 27.1	68 02 37	37 56 19	28 10 22	P	9	29.7	36	68 20 27.6	27 46 10.2	2 12.2	,,
,,	27 51 21.1	68 01 25	37 47 45	28 16 52	H	7	29.8	38	68 19 05.5	27 49 04	2 11.8	,,
,,	27 58 20.9	67 58 52	37 24 54	28 34 46	H	7	29.8	38	68 16 10.6	37 55 20	1 27.9	,,
,,	27 59 14.8	67 57 54.8	38 22 0	28 36 25	S	9	29.7	36	68 15 15.9	27 57 17	2 31	,,
,,	27 59 44.2	67 57 11	37 20 45	28 38 14	P	9	29.7	36	68 14 21	27 59 15.3	4 00.3	,,
,,	28 20 18.7	67 49 31	36 15 17	29 22 17	P	9	29.7	36	68 05 51	28 17 32.8	1 43	,,
14	10 26 42.5	64 57 34.5	14 04 58	20 10 56	R	10	29.7	39	65 15 16.6	10 25 21	3 05.8	,,
,,	10 26 45.6	64 57 30.9	14 04 44	20 10 45	S	7	29.7	36	65 15 15	10 25 24	3 04.3	,,
,,	10 36 01.7	64 52 45	13 40 32	19 33 30	S	9	29.7	36	65 10 55.1	10 34 46	3 10.2	,,
,,	10 36 34.7	64 52 35.5	13 39 14	19 31 20	P	9	29.7	39	65 10 44.6	10 35 07	2 58.6	,,
,,	10 44 40.2	64 48 17.9	13 20 0	18 58 37	S	5	29.7	36	65 06 54.5	10 43 25	3 10.7	,,
,,	10 45 30	64 48 01.5	13 18 28	18 55 24	R	7	29.7	39	65 06 38	10 44 00.5	2 55.8	,,
15	6 24 15.7	55 46 26	33 02 10	30 22 56	P	9	29.6	35	56 05 09.8	6 22 12.1	2 13.7	,,
,,	6 24 15.7	55 46 18.6	33 02 10	30 22 56	S	9	29.6	35	56 05 04.4	6 22 23	2 24	,,

„	6 25 35	55 45 34	32 56 25	30 21 06	R	10	29.6	39	56 04 16	6 24 09	2 50.7	„
„	6 31 05.2	55 43 19	32 34 32	30 18 24	P	9	29.6	35	56 01 53.4	6 29 22.3	2 33.8	„
„	6 31 05.2	55 43 11.8	32 34 32	30 18 24	S	9	29.6	35	56 01 48	6 29 33	2 44.5	„
„	6 31 24.5	55 42 58.1	32 33 20	30 17 10	R	10	29.6	39	56 01 38.5	6 29 54	2 46.3	„
„	6 37 34.7	55 40 22	32 09 58	30 13 37	P	9	29.6	35	55 58 47	6 36 10.5	2 52.5	„
„	6 37 34.7	55 40 21.4	32 09 58	30 13 37	S	9	29.6	35	55 58 51.7	6 35 58	2 40	„
„	6 38 30	55 39 41	32 06 28	30 11 55	R	10	29.6	39	55 58 13.2	6 27 23.5	3 10.2	„
„	6 44 19.4	55 37 30	31 43 00	30 07 36	P	9	29.6	35	55 55 49	6 42 40.5	2 37.7	„
„	6 44 19.4	55 37 30.9	31 43 0	30 07 36	S	9	29.6	35	55 55 53.2	6 42 30	2 27.3	„
„	6 44 40	55 36 56	31 41 43	30 06 15	R	10	29.6	39	55 55 24	6 43 33.5	3 10.2	„
„	6 55 34.2	55 32 45	30 51 46	29 55 03	H	7	29.6	37	55 50 49.5	6 53 34.3	2 16.6	„
„	6 56 27.9	55 31 59.3	30 54 30	29 53 40	S	5	29.6	37	55 50 08	6 55 05.5	2 54	„
„	6 57 59.7	55 31 32	30 51 06	29 50 49	B	8	29.6	37	55 49 30	6 56 28.5	2 45.8	„
„	7 01 06.8	55 30 15	30 32 06	29 47 38	H	6	29.6	37	55 48 16.5	6 59 09.5	2 19.2	„
„	7 06 49	55 27 34.2	30 16 25	29 38 40	B	8	29.6	37	55 45 26	6 05 22.5	2 50	„
„	7 06 50	55 27 36.2	30 10 15	29 39 40	S	9	29.6	37	55 45 36.8	7 04 58	2 24.4	„
„	7 07 51.2	55 27 21	30 07 00	29 37 49	H	7	29.6	38	55 45 19	7 05 37.8	2 03.1	„
„	7 23 12.2	55 20 31	29 03 09	29 13 32	B	7	29.6	37	55 38 09	7 21 20	2 23.8	„
August 12th to the 15th inclusive; 569 Distances; 228 slow of mean Greenwich time											2 43	

Memorandum annexed to the Lunar Observations of June and August.

The difference of the chronometers on Greenwich time having been carefully noted on the sixth of May, the day preceding their embarkation from London, the lunar observations of June and August afforded a means of ascertaining their rates since they had been on board.

1st. By 640 distances of the sun west of the moon observed in June, No. 228 was found slow 3m 44s.35 of Greenwich time at noon of the 29th of June; when the differences of the other five chronometers, obtained by comparison with 228, were also as follows:

254	259	369	404	25
Slow 1m 42s.3	slow 4m 33s	slow 0m 28s	fast 6m 52s	fast 11m 17s.5

2d. By 569 distances of the sun east of the moon observed in August, the chronometers were found to differ from Greenwich time at noon of the 14th of August, as follows:

228	254	259	369	404	25
Slow 2m 43s	slow 3m 12s	slow 6m 45s.75	fast 0m 30s	fast 7m 58s	fast 18m 57s.5

The mean of these differences of the 29th of June and of the 14th of August, being taken as the correction for each chronometer to Greenwich time at noon of the intermediate day, *viz.*, the 22d of July, the errors incidental to results obtained from distances exclusively east, or exclusively west of the moon, may be considered to be nearly balanced.

Corrections to Greenwich time on the 22d of July.

228	254	259	369	404	25
Slow 3m 13s.67	slow 2m 27s.15	slow 5m 39s.4	fast 0m 01s	fast 7m 25s	fast 15m 00s.75

By comparing these corrections with the original differences at midnight on the 6th of May, (Appendix, page xiii.) the gain or loss of each chronometer in the interim is obtained, and thence its daily rate, by dividing by 76½, being the number of days comprised in the interval:

	228	254	259	369	404	25
Mid^t. May 6.	Sl. 2m 26s.85	sl. 0m 28s. 15	sl. 0m 38s.85	fa. 1m 56s.15	fa. 4m 55s.9	fa. 3m 25s.15
Gain or loss.	L 0m 46s.82	L 2m 55s.3	L 5m 00s.5	L 1m 55s.15	G 2m 29s.1	G 11m 42s.35
Per diem.	L 0.612	L 2.29	L 3.9	L 1.5	G 1.95	G 9.18

These are the rates which were in strictness deducible from the observations; but it is necessary to explain that when the rates were actually assigned, which was as early in August as the observations could be collected from the respective observers, the mean result both of the June and of the August lunars, differed a few seconds from the more correct results obtained in a revision in the following winter, inasmuch as in their computation the mean refraction of the tables had not been in all instances corrected for variations in temperature and atmospherical pressure; the rates then deduced from them were not therefore exactly those above stated; in consequence, however, of the sun being on different sides of the moon, in the observations of June and August, and the number of distances observed on either side nearly equal, the errors of calculation in August counterbalanced in great measure those of June, the mean result being but slightly influenced, and affecting the deduction of rates so inconsiderably as not to require subsequent alteration*.

The rates actually assigned were as follows:

228	254	259	369	404	25
L 0.567	L 2.246	L 3.89	L 1.474	G 1.986	G 9.2

commencing at midnight of the 6th of May, and being in addition to the "original differences" of that date.

These rates were subsequently confirmed by an opportunity of comparing the longitude, deduced by the chronometers on the 6th of September, with the result of 6862 lunar distances.

The spot, of which the longitudes were thus compared, was a low point of land on the coast of Melville Island to the eastward of Winter Harbour, on which observations were made on the 6th of September, detailed under that date in Appendix No. III.; giving its chronometrical longitude 110° 33′ 59″.

This point was afterwards included in a survey of the harbour and adjacent

* It may not be amiss to state in proof, that the ship's longitude, at noon on the 22d of July, using the rates actually assigned, was 60° 14′ 20″.7; whereas by using those deducible from the correct result of the lunars, it would have been 60° 14′ 59″.6. Thus it will be seen, that the accumulated difference of the rates for 76¼ days, a period much exceeding half the whole season of navigation of 1819, amounts to less than 40″ of longitude.

coast, made by Captain Parry in the spring of 1820, whereby its bearing and distance from the station in which the Hecla wintered being ascertained, the difference of meridians was found equal to 11′ 16″.5 of longitude.

By the lunar observations contained in the following pages, the meridian of the Hecla's station was determined 110° 48′ 29″.2, whence the longitude of the point of land is deduced by lunar observation 110° 37′ 12″.7.

Assuming, therefore, that the result of so great a number of lunar observations was the true longitude, the rates which, on the 6th of September, had been continued through a period of four months, are chargeable with an error amounting on that day to 3′ 13″.7. being in distance rather less than 9-10ths of a geographical mile.

On the further presumption, that this amount had obtained gradually, which is usual and reasonable to suppose, it may be considered as the maximum of error, dependant on the going, or on the rates, of the chronometers, to which the longitudes determined by them, between the 6th of May and the 6th of September, are liable to be suspected.

Note.—In transcribing for the press Table III. of the Account of the Going of the Chronometers, an accidental error has been made in the rate of No. 253, between the 10th and 17th of June, which was not discovered until the sheet had passed through the press; it should have been 25ˢ.9 instead of 8ˢ.7 per diem; the change which took place at that time in the rate of No. 259, occasioned its not being included amongst the chrononometers by which the longitudes of 1819 were determined; the watch was quite new, and the probability of a considerable change of rate, before it should finally settle, had been anticipated by its makers; and it may be remarked, that it steadily maintained the rate then taken up, throughout the remainder of the voyage.

It is satisfactory to be enabled to add, that the three excellent chronometers which Messrs. Parkinson and Frodsham sent on trial, will again be employed on the Expedition which is now fitting; No. 259 having been presented by the officers of the Hecla and Griper to Captain Parry, and Nos. 253 and 254 having been purchased by the Admiralty.

It is difficult to appreciate too highly the value of chronometers, which have already borne a trial in a climate, and in circumstances so peculiarly unfavourable.

The purchase is the more satisfactory, when viewed as an encouragement on the part of Government, which Messrs. Parkinson and Frodsham have so justly merited.

LUNAR OBSERVATIONS AT WINTER HARBOUR.

The employment of the Expedition during so many months, in seas in which no geographical position had been previously known, rendered the correct determination of some one meridian an object of considerable importance.

To effect this purpose, the lunar observations contained in the following abstract, were undertaken during the detention of the ships at Melville Island; determining by their result, with as much precision as may be considered due to so great a number of distances, the meridian, passing through Winter Harbour, of the spot in which the Hecla was stationary for several months.

On the accuracy of this determination, the correctness of the longitudes in the Polar Sea, laid down by the Expedition, is in the first instance dependant.

The peculiar circumstances under which a great part of these observations were made, gave an interest to the occupation which it might not otherwise have possessed; requiring some portion of ingenuity, and much care and attention, to overcome the inconvenience and embarrassment which the extreme cold occasioned in the use of the instruments.

Every observation, made by each of the observers, has been inserted in the abstract, that an inference may be drawn of the extent of error to be apprehended, should observations be ever made under similar circumstances.

It seems worthy of remark that if the distances between the moon and stars in the winter, and between the sun and moon in spring and autumn, be separately considered, the longitude by the moon and stars will be *considerably* to the westward of that of the sun and moon. The reason of the difference is not obvious; it can scarcely have been accidental with five observers, using different instruments, and repeated on so many occasions, including every different circumstance of observation.

The error of the chronometer No. 259 on apparent time, was ascertained by observations, of which the detail will be given in Appendix, No. III.

LUNAR OBSERVATIONS AT WINTER HARBOUR.

1819	Time by 250	Apparent time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance.	Apparent Greenwich time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″	
Oct. 5	15 23 05	8 22 16	65 56 52	18 52	14 23.5	S	5	29.6	−5	66 07 02	15 44 56.5	110 40 07.5 W	D From Pollux, East
,,	15 23 45	8 22 55	65 56 07	18 54	14 25.5	R	10	29.6	−7	66 06 12	15 46 25.5	110 52 30	,,
,,	15 33 55.7	8 33 05.5	65 50 28.6	19 36	14 40	P	5	29.6	−5	66 00 25.4	15 56 45.1	110 54 54	,,
,,	15 40 43	8 39 53	65 46 32	20 01	14 51	R	10	29.6	−7	65 56 42	16 03 26.5	110 53 22.5	,,
,,	15 43 45.8	8 42 55.8	65 45 12	20 15	14 56	B	6	29.6	−6	65 55 21	16 05 48.2	110 43 06	,,
,,	15 53 41.9	8 52 52.9	65 39 18.3	20 55	15 13	S	6	29.6	−5	65 49 35.3	15 16 08	110 48 47	,,
,,	16 04 56.9	9 04 07	65 32 20.1	21 39	15 35	P	7	29.6	−5	65 42 15	16 29 13.5	110 16 37.5	,,
,,	16 14 46.6	9 13 57.1	65 28 03.6	22 18	15 55	B	7	29.6	−6	65 38 02	16 36 47	110 42 28	,,
,,	16 22 10.4	9 21 21.4	65 22 57.2	22 48	16 11	H	8	29.6	−5	65 33 00.2	16 45 46.5	110 06 16	,,
,,	16 25 59.5	9 25 10.5	65 21 39	23 03	16 19	S	6	29.6	−5	65 31 41.5	16 48 07	110 44 07.5	,,
,,	16 36 29	9 35 40	65 16 07.2	23 43	16 43.5	S	6	29.6	−5	65 26 01.9	16 58 16	110 39 00	,,
,,	16 42 19	9 41 29	65 12 30	24 04	16 58.5	R	10	29.6	−7	65 22 20	17 05 01	110 53 00	,,
,,	16 47 29.3	9 46 40.2	65 09 36.4	24 25.5	17 11	H	5	29.6	−5	65 19 21.2	17 10 11.5	111 52 49.5	,,
8	9 38 52	2 39 00.9	114 10 52	13 18	6 04	S	7	29.9	−5	114 33 46.3	10 02 49	110 57 02	D From Sun, East
,,	10 00 40.6	3 00 49.5	113 59 27	12 51.5	5 07.3	S	6	29.9	−5	114 23 48.8	10 23 46	110 44 07.5	,,
,,	15 04 00	8 04 12.7	48 05 03.3	17 42	25 26	S	6	29.9	−5	47 33 55	15 27 20	110 46 50	D From α Arietis, West
,,	16 13 00	9 13 13.4	48 41 55.5	21 20	30 11.5	S	7	29.9	−5	48 08 47.3	16 36 21	110 46 54	,,
10	29 14 32.6	22 15 37.7	82 47 03.5	34 01.5	6 56	P	10	29.6	+3	83 20 08.6	29 37 14.6	110 24 13.5	D From Sun East
,,	29 24 56.4	22 26 01.75	82 42 11.3	33 27	7 12	B	9	29.6	+3.5	83 14 32	29 49 36	110 53 34	,,
,,	29 25 09	22 26 13.5	82 42 42	33 27	7 12	S	10	29.6	+3.5	83 15 01.7	29 48 30	110 34 07.5	,,
,,	29 35 56.1	22 37 01.3	82 38 22.3	32 46	7 28	P	7	29.6	+3	83 10 18.4	29 58 57.2	110 28 58	,,
,,	29 47 02.25	22 48 07	82 33 29.6	32 08	7 42	S	8	29.6	+3.5	83 04 57	30 10 47	110 40 0	,,
,,	29 58 19.2	22 59 24.75	82 28 26.6	31 29	7 54	B	9	29.6	+3.5	83 00 26	30 20 45.6	110 20 15	,,
,,	30 18 47.7	23 19 52.7	82 20 18.5	30 10	8 11.5	S	9	29.6	+3.5	82 50 43.6	30 42 12	110 34 50	,,
11	29 30 06.25	22 31 30.6	71 44 09.6	32 49	6 57.75	H	10	29.5	−5	72 22 06.8	29 53 37.25	110 31 39.7	,,
,,	29 32 33.8	22 33 58	71 42 52.2	32 42	7 01	B	8	29.5	−6	72 20 42	29 56 41	110 42 15	,,
,,	29 35 32.3	22 36 55.1	71 41 35	32 32.5	7 06	S	9	29.4	−6	72 19 20.5	29 59 44	110 42 14	,,

Oct. 11	30	10	57.9	23	12	20.9	71	27	46	30	33.7	7	43	S	10	29.4	−6	72	03	47.2	30	34	13	110	28	02	D From Sun, Ecl.
„	30	14	08	23	15	32.6	71	26	11.1	30	22	7	45.5	B	4	29.5	−6	72	02	06.8	30	37	55.2	110	35	39	„
„	30	14	30.6	23	15	55.2	71	26	08.3	30	20.5	7	46	P	10	29.5	−6	72	02	08	30	37	53	110	29	27	„
„	30	18	31.6	23	19	54.6	71	24	09.8	30	06.5	7	48.7	S	10	29.4	−6	71	59	56	30	42	45	110	42	36	„
„	30	25	34.5	23	26	58.7	71	21	06.5	29	41	7	53	S	10	29.4	−6	71	56	37	30	50	06	110	46	49.5	„
„	30	35	00.8	23	36	25.7	71	17	01	29	06.5	7	57.5	B	14	29.5	−6	71	52	19.2	30	59	36.6	110	47	54	„
„	30	36	47.3	23	38	12.2	71	16	41.5	29	00	7	58	P	10	29.5	−6	71	51	58.8	31	00	21.4	110	31	48	„
„	30	44	53	23	46	18	71	13	11.3	28	29.7	8	00.5	P	10	29.5	−6	71	48	14.8	31	08	37.6	110	34	54	„
„	30	53	27.4	23	54	52.4	71	09	06.4	27	57.5	8	01.7	B	9	29.5	−6	71	43	55	31	18	13.5	110	50	16	„
„	30	54	22.75	23	55	47.9	71	09	20.4	27	54	8	02	H	10	29.5	−5	71	44	10.5	31	17	40.1	110	28	03.5	„
12	7	04	17	00	05	42.2	71	05	14.6	27	04.75	8	01	P	10	29.5	−6	71	39	49	7	27	18	110	23	57	„
„	7	27	56	00	29	20	70	54	20.5	25	44.3	7	54.25	S	10	29.5	−6	71	28	44	7	51	52	110	38	0	„
„	7	29	20.2	00	30	45.6	70	53	38.8	25	38.75	7	53.3	P	10	29.5	−6	71	27	54.8	7	53	41.7	110	44	01.5	„
„	7	34	26.7	00	35	50.7	70	51	11.7	25	18.5	7	51	S	10	29.5	−6	71	25	29	7	59	03	110	48	05	„
„	7	42	31.2	00	43	56.8	70	48	16.6	24	47	7	44.75	H	10	29.5	−6	71	22	24.4	8	05	53.2	110	29	06	„
„	7	43	56	00	45	20	70	46	51.2	24	41.5	7	44.3	S	11	29.5	−6	71	21	06	8	08	47	110	51	45	„
„	7	54	54	00	56	19.6	70	42	20.5	23	58	7	34	P	10	29.5	−6	71	16	26.6	8	19	04.4	110	41	12	„
„	8	03	00.67	1	04	26.4	70	39	02.7	23	26	7	26	H	3	29.5	−6	71	13	07.2	8	26	26.8	110	30	06	„
„	8	14	03	1	15	28.8	70	34	02.5	22	38.3	7	11.5	H	10	29.5	−6	71	08	09.4	8	37	26.2	110	29	21	„
„	8	25	34.54	1	27	01.64	70	28	41.5	21	55.5	6	57	B	7	29.5	−6	71	03	06	8	48	38	110	24	15	„
„	8	26	45.3	1	28	11.2	70	28	02	21	52	6	55.5	P	8	29.5	−6	71	02	11.6	8	50	38.8	110	36	54	„
13	29	17	15.3	22	19	15.9	49	50	53.6	28	07.5	5	55	P	10	30	−4	50	40	51.8	29	41	07	110	27	46.5	„
„	29	41	38	22	43	38.6	49	40	53	27	21.5	6	30.3	H	11	30	−4	50	29	12	30	06	35	110	44	06	„
„	29	42	06.8	22	44	07.6	49	40	57.5	27	20.5	6	30.75	P	10	30	−4	50	29	07.6	30	06	44.4	110	39	12	„
„	29	49	24	22	51	22.5	49	38	21.8	27	05.75	6	39.75	S	10	30	−3	50	26	08.8	30	13	15	110	28	07.5	„
„	29	52	36.8	22	54	37.5	49	36	41	26	58	6	43	H	10	30	−4	50	24	10.1	30	17	33.7	110	44	03	„
„	29	56	03.25	22	58	04.25	49	35	52.8	26	50.5	6	46.5	B	10	30	−4	50	23	12	30	19	40	110	23	57	„
„	29	57	16.4	22	59	54.9	49	34	46.1	26	46	6	48.5	S	10	30	−3	50	22	00.8	30	22	15.5	110	35	07.5	„
„	30	06	02.1	23	08	03.1	49	31	27.8	26	19	6	55.5	P	10	30	−4	50	18	04.4	30	30	50.5	110	41	51	„
„	30	26	15.8	23	28	16.8	49	23	30.5	25	33.5	7	09	H	10	30	−4	50	09	07	30	50	24	110	31	48	„
„	30	39	55.65	23	41	57.5	49	18	10.3	24	55.8	7	15.8	B	10	30	−4	50	03	06	31	03	31	110	23	30	„
„	30	40	19.7	23	42	20.8	49	17	22.2	24	52.8	7	16	H	10	30	−4	50	02	14.4	31	05	23.5	110	45	40.5	„

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1819	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes		Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
				Moon's centre	Sun's centre, or Star								
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″	
Oct. 13	30 53 55	23 56 06.7	49 12 01.2	24 14.4	7 16.7	P	10	30	−4	49 56 22.4	31 18 08.4	110 30 25 W	D From Sun, East
14	7 07 05.54	0 09 07.14	49 06 33.2	23 34	7 15	B	10	30	−4	49 50 26	7 31 07.5	110 30 07	,,
,,	7 13 44.5	0 15 46	49 03 18	23 13.2	7 13.7	H	5	30	−4	49 46 54.3	7 38 49	110 45 45	,,
,,	7 16 51.6	0 19 03.4	49 02 14.6	23 02.6	7 12.2	P	10	30	−4	49 45 45.4	7 41 17	110 34 24	,,
,,	7 28 37.2	0 30 39.1	48 57 32	22 23	7 07.4	B	10	30	−4	49 40 37.4	7 52 31.5	110 28 06	,,
,,	7 33 51.6	0 35 53.2	48 55 15.9	22 04.3	7 05	H	10	30	−4	49 38 08.5	7 57 54	110 30 12	,,
,,	7 37 54.9	0 39 56.9	48 53 33.7	21 50.5	7 02.2	P	10	30	−4	49 36 12	8 02 07.2	110 34 34.5	,,
,,	7 50 02.16	0 52 04.1	48 48 16.1	21 07.6	6 53.8	B	10	30	−4	49 30 41	8 14 10	110 31 30	,,
,,	7 54 20.75	0 56 20.4	48 46 38.1	20 52.2	6 51	S	10	30	−3	49 28 57	8 17 58	110 24 24	,,
,,	8 01 32.3	1 03 31.95	48 43 08.7	20 25.8	6 42	S	10	30	−3	49 25 22	8 25 47	110 33 45	,,
,,	8 01 23	1 03 24.9	48 41 18	20 16	6 38.6	H	10	30	−4	49 23 24.8	8 30 00.6	110 53 55.5	,,
,,	8 07 25	1 09 29	48 39 53	20 05.3	6 36	R	10	30	−4	49 21 55	8 33 10.5	110 55 22.5	,,
29	16 13 38.9	9 18 43	39 26 42.1	12 22.25	34 34	S	9	29.7	−28	38 35 59.4	16 41 59	110 49 0	D From α Arietis, East
,,	16 33 40.08	9 38 41.1	39 15 59.6	12 30.8	35 23.2	P	10	29.7	−30	38 24 07	17 02 48.2	111 01 02	,,
,,	16 56 38.4	10 02 33.5	39 03 59.2	12 23	36 13.3	B	10	29.73	−28	38 11 01	17 25 25.8	110 43 04.5	,,
30	16 06 15	9 11 24.6	55 55 29.4	18 18.7	19 47	S	11	29.8	−27	55 29 25.1	16 34 50	110 51 21	D From Aldebaran, East
,,	16 26 30.42	9 31 40.22	55 45 25	18 46	21 05.1	P	12	29.7	−27	55 18 10.4	16 54 37.8	110 44 24	,,
,,	16 46 19.1	9 51 27.1	55 35 03	19 07.5	22 19	B	10	29.8	−27	55 06 39	17 14 43.6	110 49 07.5	,,
,,	17 13 01	10 18 10.8	55 21 03	19 25.9	23 54.2	S	10	29.8	−27	54 51 05.6	17 41 37	110 51 33	,,
,,	17 54 19.4	10 59 27.4	54 59 48	19 29.8	26 10.5	B	13	29.8	−27	54 27 54.5	18 22 37.9	110 47 37.5	,,
Nov. 28	12 57 33.5	6 00 17.4	34 39 03	21 43.3	15 03	P	10	29.7	−35	34 39 26	13 25 10.2	111 13 12	,,
,,	13 00 09	6 02 53	34 48 09	21 52	15 13	S	10	29.7	−35	34 38 28	13 26 58	111 01 15	,,
,,	13 49 03.7	6 51 46.4	34 23 04	24 33.8	18 25	B	10	29.7	−34	34 11 38.8	14 17 25	111 24 39	,,
,,	13 50 48	6 53 31.3	34 22 50.4	24 40	18 32	S	12	29.7	−35	34 11 20	14 18 05	111 07 10	,,
,,	14 08 05.9	7 10 46.7	34 14 38.6	25 31.7	19 39	B	10	29.7	−34	34 02 26.8	14 34 41.6	110 58 43	,,
29	12 24 50.7	5 27 18.4	64 32 29	21 46.2	15 34	P	11	29.7	−36	64 11 58.8	12 51 51.6	111 08 18	D From Pollux, East
,,	12 26 15.2	5 28 42.6	64 32 10.9	21 52	15 36.5	S	10	29.71	−36	64 11 33.1	12 52 32.5	110 57 28	,,

„	12 40 32.6	5 42 59.8	64 24 19.8	22 48	16 06.5	S	10	29.71	—36	64 03 38.5	13 07 02	111 00 33			
„	12 42 11.1	5 44 38.9	64 23 18.8	22 54.5	16 11.2	B	10	29.7	—36	64 02 34.5	13 08 57	111 04 39			
„	12 57 35.5	6 00 03.7	64 14 37.4	23 54.5	16 45.5	P	10	29.7	—36	63 53 46	13 25 01.4	111 14 26			
„	12 57 50.25	6 00 17.6	64 15 10.8	23 55.5	16 49.75	B	10	29.7	—36	63 54 16	13 24 05.1	110 56 52			
„	14 06 54.3	7 09 20.5	63 38 10.4	28 08.5	19 59	S	10	29.71	—36	63 15 58.7	14 33 48	111 06 52			
„	14 07 13	7 09 41	63 37 20.4	28 09.5	19 59	P	11	29.7	—36	63 15 00	14 35 35	111 28 30			
„	14 21 27	7 23 53	63 30 42.3	28 57	20 46.5	S	7	29.71	—36	63 08 07	14 48 06	111 03 15			
„	14 25 21.1	7 27 47.6	63 28 43	29 09.5	21 00.5	B	10	29.71	—36	63 05 55.6	14 52 09	111 05 21			
„	14 30 07.6	7 32 33.6	63 26 06.6	29 25	21 15	S	7	20.71	—36	63 03 15.3	14 56 37	111 05 51			
„	14 44 20.2	7 46 47.6	63 18 36.5	30 08.6	22 03.5	P	11	29.7	—36	62 55 49.6	15 10 32	110 56 06			
„	14 45 24.7	7 47 50.6	63 18 27.9	30 08.8	22 08.7	B	10	29.7	—36	62 55 00	15 12 03.6	111 03 15			
„	15 30 54.2	8 33 19.7	57 53 15.5	32 14.4	27 19	P	11	29.7	—36	57 58 34	15 55 16.8	110 28 16.5	☽	From α Pegasi, West.	
„	15 36 28	8 38 52.9	57 56 53	32 27.5	27 07	S	8	29.7	—36	58 02 29	16 03 06	111 03 17			
„	15 53 50.4	8 56 15.2	58 04 33	33 08.5	26 30.3	S	7	29.7	—36	58 11 06	16 20 26	111 02 42			
„	16 20 53.9	9 23 18	58 16 28.2	33 56	25 14.5	S	10	29.7	—36	58 24 44	16 47 50	111 08 00			
„	16 22 40.5	9 25 04.8	58 16 25.4	33 57.8	25 09.2	B	10	29.7	—36	58 24 49.2	16 48 03.3	110 44 37			
„	16 53 13.3	9 55 37.4	62 13 59.1	34 38.5	30 12.3	B	10	29.7	—36	61 44 42.2	17 20 17.4	111 10 00	☽	From Pollux, East	
„	16 54 07.2	9 56 31.8	62 13 34.7	34 39.5	30 15.6	P	11	29.7	—36	61 44 10.8	17 21 10.7	111 09 43			
„	17 27 43.2	10 30 06.4	61 56 47.3	35 04	32 27	S	7	29.7	—36	61 25 33	17 55 15	111 17 06			
„	17 29 30.3	10 31 54.5	61 56 38.6	35 05	32 34	P	11	29.7	—36	61 25 28	17 55 24.5	110 52 30			
„	17 56 23.1	10 58 45.7	61 42 48	35 08	34 16	S	10	29.7	—36	61 09 58	18 23 41	111 13 51			
„	17 57 59.7	11 00 22.9	61 42 14.7	35 07.8	34 24.5	B	10	29.7	—36	61 09 20.8	18 24 50.9	111 07 00			
„	18 18 52.2	11 21 15.6	61 31 33	34 59.5	35 41.3	B	11	29.71	—36	60 57 27.2	18 46 34	111 19 36			
30	12 09 50.5	5 12 00.6	51 31 43	21 25.7	15 11.3	P	6	29.7	—35	51 15 35	12 36 33.9	111 08 19.5			
„	12 10 19.8	5 12 29.9	51 31 33	21 37.5	15 13.75	S	8	29.68	—36	51 15 21.2	12 37 02	111 08 02			
„	12 15 06	5 17 16.1	51 29 12	21 56.2	15 21	P	6	29.7	—35	51 12 39.6	12 41 58.6	111 10 37.5			
„	12 18 58	5 21 07.8	51 26 43.1	22 11.5	15 30	S	8	29.68	—36	51 10 40.3	12 45 41.5	111 08 25			
„	12 27 28.7	5 29 38.7	51 22 09.1	22 44.8	15 47.4	B	11	29.7	—35	51 06 10.2	12 54 02.25	111 05 52			
„	12 28 21.4	5 30 31.2	51 21 26.4	22 48	15 49	S	8	29.68	—36	51 05 29.2	12 55 19.5	111 12 05			
„	12 39 59.9	5 42 09.4	51 15 22.4	23 33.7	16 14.1	P	7	29.7	—35	50 59 28	13 06 23.3	111 03 19.5			
„	12 45 17.1	5 47 25	51 12 14	23 55	16 29.1	B	11	29.7	—35	50 56 21.8	13 12 11.5	111 11 35			
„	12 46 34.3	5 48 43.8	51 11 38	23 59	16 29	P	6	29.7	—35	50 55 13.8	13 14 13.5	111 22 25.5			

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1819	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″ W	
Nov. 29	13 50 05.3	6 52 14	50 37 58.6	28 09.3	19 19.5	P	11	29.7	—35	50 21 52	14 16 01	110 57 45	☽ From Pollux East.
,,	14 09 31.7	7 11 38.2	50 27 43.75	29 22.5	20 21.3	B	11	29.7	—35	50 11 17.6	14 35 40.8	111 00 39	,,
,,	14 13 23.3	7 15 31.7	50 10 34.75	29 37	20 33	S	12	29.68	—36	50 09 34.75	14 38 50	110 49 35	,,
,,	14 40 02.5	7 42 08.5	50 12 12	31 14	22 02.4	B	11	29.7	—36	49 55 07.2	15 05 38.5	110 52 30	,,
,,	14 41 22.4	7 43 30.7	50 11 49.4	31 18.5	22 06	P	12	29.7	—35	49 54 47	15 06 17.7	110 41 45	,,
,,	15 13 33.1	8 15 40.4	49 54 59.5	31 08	24 02.5	S	8	29.68	—36	49 36 56.2	15 39 24	110 55 53	,,
,,	15 14 21	8 16 28.3	49 53 48.3	33 10.5	24 05.5	P	10	29.7	—35	49 35 46.2	15 41 31.7	111 15 51	,,
,,	15 24 48.6	8 26 55.7	49 49 06.8	33 44	24 44.5	S	8	29.68	—36	49 30 37.5	15 51 06.5	111 02 44	,,
,,	15 29 54	8 31 59.3	49 46 50	34 00	25 03.5	B	10	29.7	—35	49 28 20	15 55 22.3	110 50 45	,,
,,	15 32 04.7	8 34 11.6	49 45 19	34 06	25 12	S	8	29.68	—36	49 26 38.8	15 58 29	111 04 22	,,
,,	15 45 20.1	8 47 27	49 38 37	34 49.8	26 02.3	P	12	29.7	—35	49 19 31	16 11 40	111 03 15	,,
,,	15 47 00.2	8 49 05.2	49 37 59.5	34 50.5	26 08.7	B	10	29.7	—35	49 18 48.2	16 13 03	110 56 26	,,
Dec. 1.	16 09 58.5	9 11 46	36 00 46.5	36 01.1	27 49.2	R	10	29.58	—36	36 18 08	16 35 44	110 59 30	,,
,,	16 10 08.5	9 11 56.5	35 59 45.4	36 01.5	27 55	P	11	29.6	—36	36 16 48	16 38 02.9	111 31 36	,,
,,	16 14 06	9 15 53.9	35 58 24.3	36 17	28 14	S	9	29.58	—36	36 15 28.8	16 40 40	111 11 30	,,
,,	16 27 57.4	9 29 46	35 51 44.7	36 59.8	29 04.9	B	11	29.6	—34	36 08 22.4	16 54 07	111 05 15	,,
,,	16 30 18.4	9 32 05.9	35 50 27.9	37 07	29 14	S	10	29.58	—36	36 07 02.9	16 56 36	111 07 32	,,
,,	16 45 43.4	9 47 31.4	35 42 10	37 51	30 15	P	11	29.6	—36	35 58 07.6	17 13 22.5	111 27 46.5	,,
,,	16 46 13.6	9 48 02	35 42 44.4	37 52.2	30 16.5	B	10	29.6	—34	35 58 39.2	17 12 30.5	111 07 07	,,
,,	16 48 09.5	9 49 57	35 41 31	37 57.7	30 19	R	10	29.58	—36	35 57 49	17 14 16.5	111 04 07.5	,,
,,	17 31 48.9	10 33 35.6	40 18 17.4	39 45	37 07	S	7	29.58	—36	39 54 07.4	17 58 38	111 15 36	☽ From α Arietis West.
,,	18 02 52.7	11 04 39	40 32 20	40 45	36 17	S	8	29.58	—36	40 09 59.5	18 29 19	111 10	,,
,,	12 05 28.3	5 07 01.6	49 59 36.5	19 22	28 30	S	10	29.6	—35	49 26 49.2	12 30 19.5	110 49 28	,,
,,	12 06 08.4	5 07 43	50 00 13	19 24	28 32.6	P	13	29.6	—36	49 27 28	12 31 33.1	110 57 31.5	,,
,,	12 24 28.75	5 26 01.75	50 10 31	20 23	29 40	S	12	29.6	—35	49 37 10.7	12 50 30.5	111 07 11	,,
,,	12 26 39.2	5 28 11.7	50 11 28.8	20 30.2	29 47.5	B	11	29.6	—36	49 38 09.8	12 52 26	111 03 35	,,
,,	12 45 59.7	5 47 33.8	50 22 05	21 35.6	30 55.4	P	13	29.6	—36	49 48 20	13 12 12.1	111 09 34.5	,,

	"	12 54 24.9	5 55 56.1	50 26 12	22 05	31 24	B	10	29.6	−36	49 52 16.6	13 19 56.2	111 00 01	"
	"	14 04 25	7 05 57.9	51 02 48	26 21.8	34 50.9	P	13	29.6	−36	50 28 13.4	14 30 01.1	111 00 49	"
	"	14 23 15.6	7 24 46.9	51 12 33.8	27 34	35 35	S	10	29.6	−35	50 38 01.5	14 49 12	111 06 17	"
	"	14 23 41.5	7 25 11.3	51 12 42.3	27 35.4	35 36.3	B	12	29.6	−36	50 38 11.5	14 49 31.2	111 05 00	"
	"	14 45 13.6	7 46 43.1	51 23 30.7	28 58	36 19.8	B	9	29.6	−36	50 49 10	15 10 59.8	111 04 11	"
	"	14 59 00.1	8 00 31.9	51 30 56.5	29 51.1	36 43.5	P	11	29.6	−36	50 56 37	15 25 31.7	111 14 57	"
	"	15 01 15.7	8 03 24.5	51 32 52.5	30 02.5	36 48.3	B	10	29.6	−36	50 58 43.5	15 29 39	111 33 30	"
	4	15 41 30.5	8 42 11.7	45 36 21.5	23 12.3	26 32	P	11	29.4	−36	45 10 26.4	16 07 56.1	111 26 06	D From Aldebaran West
	"	15 41 52.5	8 42 41.8	46 36 38.2	24 15	26 33	S	10	29.4	−36	45 10 47.4	16 08 40	111 29 33	"
	"	15 55 42.7	8 56 31	45 43 15	25 04.7	27 13.5	B	10	29.4	−36	45 17 17.5	16 21 59.5	111 22 0	"
	"	15 58 31.75	8 59 20.9	45 45 15.7	25 16	27 21	S	10	29.4	−36	45 19 17.9	16 26 06	111 41 36	"
	"	16 11 05.4	9 11 50.8	45 51 18.6	26 02.2	27 55.2	B	10	29.4	−36	45 25 18.8	16 36 25.1	111 38 35	"
	"	16 11 08.6	9 11 50.3	45 51 14	26 02.5	27 55.4	P	10	29.4	−36	45 25 25.4	16 38 38.3	111 42 00	"
	"	16 23 58.1	9 24 38.6	45 57 38.5	26 50	28 27.7	P	11	29.4	−36	45 31 48	16 51 42.2	111 45 54	"
	"	16 25 22.4	9 26 11.1	45 58 13.7	26 56	28 31	S	10	29.4	−36	45 32 15.7	16 52 39	111 36 59	"
	"	16 37 20	9 38 18.4	46 04 29.7	27 41	28 59	S	10	29.4	−36	45 38 31.4	17 05 28	111 47 25	"
	"	16 38 20.3	9 39 08.3	46 04 07.3	27 43	29 01.8	B	10	29.4	−36	45 38 10.6	17 04 47.5	111 24 48	"
	"	16 50 57.5	9 51 37.3	46 10 30.2	29 28	28 30	P	10	29.4	−36	45 44 55.2	17 18 35	111 44 25.5	"
	"	16 54 01.7	6 54 49.4	46 12 16.5	28 41.3	29 34.1	B	10	29.4	−36	45 46 26.6	17 21 45.5	111 44 00	"
	27	13 23 04.6	6 42 55.9	54 11 13	34 12.5	25 40	P	10	29.9	−29	53 51 22	14 03 02.8	110 01 43	D From Polaris East
	"	13 39 01.7	6 58 49.6	54 03 07.3	34 54	26 41.4	B	10	29.9	−29	53 41 25	14 21 52	110 45 36	"
	"	13 40 20.5	7 01 36.5	54 02 26.8	34 56.7	26 46.5	S	10	29.9	−29	53 40 38.3	14 23 19	110 46 47	"
	"	13 57 05.9	7 16 56.6	53 55 09	35 36.8	27 51.8	P	11	29.9	−29	53 32 39.6	14 38 11.2	110 18 89	"
	"	14 00 17.1	7 20 04.5	53 52 52	35 44.2	28 04.2	B	10	29.9	−29	53 30 12	14 42 55	110 42 38	"
	"	14 18 11.7	7 38 01.9	53 44 45	26 20.6	29 14.7	P	10	29.9	−29	53 21 15	14 59 43	110 25 16.5	"
	"	14 18 35.3	7 39 51.3	53 53 43.5	33 21.4	29 16	S	9	29.9	−29	53 20 12	15 01 41.4	110 49 06	"
	"	14 37 58.8	7 57 45.4	53 34 22.5	36 54.6	30 32.6	B	10	29.9	−29	53 09 50.8	15 21 07.3	110 50 28	"
	"	15 41 55	9 01 40.2	53 03 50	37 58	34 41.7	R	10	29.9	−31	52 35 52.4	16 25 00	110 49 57	"
	"	16 01 50.5	9 21 35.3	52 54 55	38 02.7	35 54.3	R	10	29.9	−31	52 25 27	16 44 37	110 45 27.5	"
	"	16 26 46.4	9 46 30.7	52 42 28.5	37 59.3	37 21	R	10	29.9	−31	52 11 44	17 10 25	110 58 34.5	"
	"	11 44 01.6	10 03 45.6	52 33 55	37 50	38 18.3	R	10	29.9	−31	52 02 26.4	17 27 33	110 56 51	"
	28	11 39 45.5	4 59 13.2	33 35 30.6	28 30	34 19.5	S	8	30.35	−40	33 35 20.6	12 24 08	111 13 37	D From α Arietis West

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1819	Time by 259	Apparent Time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN.	°	° ′ ″	H M S	° ′ ″	
Dec. 26	11 40 18.1	4 59 45.6	33 35 17	28 32	34 21	P	11	30.25	—41	33 35 05.4	12 23 40	110 58 36 W	☽ From α Arietis, West.
,,	11 56 45.5	5 16 10.5	33 43 09	29 15.2	35 03	B	10	30.35	—41	32 43 14.8	12 39 37	110 51 37	,,
,,	11 56 27.6	5 15 55.1	42 06 47.6	29 34	20 44.5	S	10	30.35	—41	41 54 01.6	12 39 00.5	110 46 21	☽ From Pol. lux, East.
,,	12 10 02.5	5 29 28.9	41 59 16	30 25.7	21 29.6	P	10	30.25	—41	41 46 23.2	12 53 30.3	111 00 21	,,
,,	12 13 57	5 32 29.3	41 57 47.7	30 37.3	21 40.1	B	10	30.35	—41	41 44 51.2	12 56 28.7	110 59 51	,,
,,	12 25 23.4	5 44 49	41 51 23	31 23.1	22 22.7	P	10	30.25	—41	41 38 15.4	13 09 59.2	111 02 33	,,
,,	12 28 51.5	5 48 18.2	41 50 20.7	31 36	22 35	S	10	30.35	—41	41 37 06.7	13 11 14	110 43 57	,,
,,	12 38 36	5 58 02.5	41 44 47	32 12	23 10	S	10	30.35	—41	41 31 22.2	13 22 10	111 01 52	,,
,,	12 39 14.7	5 58 38.2	41 44 35.3	32 14	23 12.6	B	11	30.35	—41	41 31 10.4	13 22 31	110 57 32	,,
,,	13 39 21.3	6 58 46.5	41 15 03	35 39.3	26 58.2	P	10	30.25	—41	40 59 56	14 21 55	110 47 07.5	,,
,,	13 39 48.2	6 59 10.5	41 14 56	35 40.8	26 59.6	B	10	30.35	—41	40 59 46.8	14 22 21	110 47 37	,,
,,	13 52 55.7	7 12 20.7	41 08 07	36 20.7	27 51.1	P	10	30.35	—41	40 52 31	14 36 04.8	110 56 01.5	,,
,,	13 53 46.7	7 13 11.7	41 07 57.7	36 23.7	27 54.5	S	10	30.35	—41	40 52 18.2	14 36 36	110 51 05	,,
,,	14 05 08	7 24 33	41 02 28.3	36 56	28 39	S	10	30.35	—41	40 46 15.6	14 48 06	110 52 18	,,
,,	14 05 36.5	7 24 58.2	41 02 00.6	36 57.3	28 41	B	10	30.35	—41	40 45 54.2	14 48 49.5	110 57 50	,,
,,	14 19 28.45	7 38 50	40 55 13.2	37 35	29 35.6	B	10	30.35	—41	40 38 31.6	15 02 52	111 00 30	,,
,,	14 20 00.3	7 39 24.7	40 54 23	37 36.5	29 37.7	P	10	30.25	—41	40 37 41	15 04 28.4	111 15 55.5	,,
,,	14 40 11.3	7 59 35.3	40 45 44.4	38 27.5	30 57	S	10	30.35	—41	40 28 05.5	15 22 47	110 47 55	,,
,,	14 40 25.6	7 59 49.5	40 45 00	38 27.8	30 58	P	10	30.25	—41	40 27 21.8	15 24 08.3	111 04 42	,,
,,	14 54 51.1	8 14 11.8	40 38 16	39 00	31 54.6	B	10	30.35	—41	40 19 57	15 38 18	111 01 33	,,
,,	15 43 03.5	9 02 23.5	40 15 57	40 22.5	34 57.9	R	10	30.3	—41	39 55 09	16 25 38	110 48 52.5	,,
,,	15 58 00.3	9 17 20	40 08 49	40 40.2	35 52.4	R	10	30.3	—41	39 47 12	16 41 09	110 57 15	,,
,,	16 19 46.2	9 39 05.9	39 58 32	40 58	37 08.5	R	10	30.3	—41	39 35 55	17 02 24	110 49 31.5	,,
29	11 50 55.5	5 09 57.7	29 34 27.2	27 36	20 39.5	S	10	30.65	—41	29 26 22.8	12 33 18.5	110 50 12	,,
,,	11 31 10.2	4 50 11.7	45 48 42	26 21.3	34 13.5	P	10	30.65	—41	45 41 46.2	12 14 23.6	111 02 58.5	☽ From α Arietis, West.
,,	11 50 37.1	5 09 35.9	45 58 42.1	27 35	34 57.2	B	10	30.63	—41	45 55 57.4	12 34 20.5	111 11 09	,,
,,	12 04 52.1	5 23 53	46 06 18	28 30.6	35 31	P	10	36.65	—41	46 03 46.4	12 49 40.1	111 26 46.5	,,

„	12 08 08.8	5 27 07.2	46 07 52.5	28 43.4	35 38.2	B	10	30.63	−41	46 05 15	12 52 34.8	111 21 54	☽ From α Arietis West
„	14 10 31	7 29 28	47 06 03	36 11.5	37 48	R	10	30.6	−42	47 06 49.5	14 53 26	110 59 30	„
„	14 36 11.4	7 55 08.4	47 18 15	37 34.2	37 41.2	R	10	30.6	−42	47 20 07	15 19 32.6	111 06 01.5	„
„	15 23 12	8 42 08	47 40 0	39 46.9	36 49.3	R	10	30.6	−42	47 44 08	16 06 42	111 08 30	„
30	11 05 38.3	4 24 15.1	57 49 25	21 59.3	33 05.1	P	10	30.65	−35	57 43 42	11 48 14.5	110 59 49	„
„	11 21 14.4	4 39 48.5	57 57 55.2	22 51.5	33 50.3	B	10	30.65	−33	57 51 54	12 04 37	111 12 07	„
„	11 39 11.2	4 57 47.4	58 07 08	23 55.5	34 39	P	10	30.65	−35	58 01 03.6	12 22 44.1	111 14 10.5	„
„	11 40 40.3	4 49 13.9	58 07 56.1	24 01	34 42.5	B	10	30.65	−33	58 01 45.5	12 24 06.5	111 13 09	„
„	11 55 08.2	5 13 43.9	58 15 18	24 53.9	35 15.7	P	11	30.65	−35	58 09 03.8	12 37 41.1	110 59 18	„
„	12 10 42.5	5 32 06.9	58 23 10	25 51.8	35 52.2	B	11	30.65	−33	58 16 48	12 53 53.2	111 09 22	„
„	12 27 29.4	5 46 05.4	58 31 30	26 54.8	36 24.9	P	10	30.65	−35	58 25 10.2	13 10 26.2	111 05 29	„
„	12 30 55.1	5 19 27.9	58 33 19.9	27 08	36 30.8	B	10	30 65	−33	58 27 00.8	13 14 07	111 09 47	„
1820 Jan. 3	15 00 17.4	8 17 11.5	77 05 11	13 09.1	30 32.4	P	11	30.65	−42	76 27 49	15 41 47.7	111 09 03	☽ From Aldebaran West
„	15 18 0	8 34 55.2	77 13 38.8	14 22.25	30 54	S	10	30	−42	76 36 08	15 58 56	111 00 12	„
„	15 19 26.2	8 36 16.9	77 14 24.7	14 27.2	30 57.2	B	10	29.98	−42	76 36 49	16 00 21.3	111 01 06	„
„	15 36 58.1	8 53 51.8	77 23 36	15 30.3	31 10.4	P	10	30.03	−42	76 45 53.4	16 19 04	111 18 03	„
„	16 26 07	9 52 58	77 51 25	19 02.3	31 17.8	R	10	30	−45	77 13 57	17 16 57	110 59 45	„
„	16 55 19	10 12 10	78 00 47	20 10.7	31 12.8	R	10	30	−45	77 23 31	17 36 39	111 07 15	„
„	17 14 06	10 30 56	78 09 19	21 15.5	30 47	R	10	30	−45	77 32 37	17 55 26	111 07 30	„
27	11 48 52.7	4 59 03.3	36 42 09	25 36.7	27 06.5	P	10	29.88	−37.5	36 51 36.4	12 22 24.5	110 50 18	„
„	11 59 41.8	5 09 52.3	36 47 35	29 16.8	27 35.8	B	10	29.88	−37	36 57 02	12 33 43.2	110 57 43.5	„
„	12 08 26.3	5 18 36.7	36 51 45	29 49.9	28 17.5	P	5	29.88	−37.5	37 00 50.8	12 41 36.5	110 44 47	„
April 16	28 57 22.2	22 23 36.5	60 31 49	27 40.75	24 28	P	12	30.1	−9	60 52 28.6	29 46 18	110 40 22.5	☽ From Sun West
„	28 57 22.2	22 23 36.5	60 31 33.5	27 40.75	24 28	S	12	30.1	−9	60 52 18.5	29 45 42	110 31 22.5	„
„	28 59 27	22 25 0.1	60 32 38	27 46.7	24 30.6	R	7	30.1	−9	60 53 23	29 47 54.1	110 43 16.5	„
„	29 14 42.7	22 40 27.4	60 40 11	28 44	24 54.1	P	10	30.1	−9	61 00 50.8	30 03 07.9	110 40 07.5	„
„	29 14 42.7	22 40 27.4	60 39 47.5	28 44	24 54.1	S	10	30.1	−9	61 00 30.5	30 02 26	110 29 39	„
„	29 25 52.1	22 51 36.7	60 45 19.5	29 26.7	25 10	B	10	30.1	−9	61 06 08.2	30 13 56.3	110 34 54	„
„	29 27 04.4	22 52 49.1	60 46 21	39 31.3	25 11.4	P	10	30.1	−9	61 07 04	30 15 50.3	110 45 19.5	„
„	29 35 10.6	23 00 55.3	60 49 30	30 02.7	25 21.1	B	11	30.1	−9	61 10 23.6	30 22 38.25	110 25 44	„
„	29 38 21.8	23 04 06.6	60 51 54	30 15.2	25 24.5	P	10	30.1	−9	61 12 40	30 27 17.5	110 47 43.5	„
„	29 46 15.2	23 12 00	60 55 33	30 45.8	25 32.5	P	10	30.1	−9	61 16 22	30 34 52.5	110 43 07.5	„

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1820	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes		Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich Time	Longitude	Phænomena
				Moon's centre	Sun's centre, or Star								
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″ W	☽ From Sun West
April 16	29 46 15.2	23 12 00	60 55 06	30 45.8	25 32.5	S	10	30.1	—9	61 16 03	30 34 12	110 34 00	
,,	29 56 10	23 21 55	61 00 13	31 23.5	25 40.6	S	9	30.1	—9	61 21 15.5	30 44 51	110 44 00	,,
,,	29 56 58.2	23 22 43.1	61 00 11.7	31 26	25 41.3	B	11	30.1	—9	61 21 20	30 45 00.8	110 34 20	,,
,,	30 07 19.2	23 33 04.1	61 05 19	32 06	25 47	P	10	30.1	—9	61 26 29.4	30 55 34.8	110 37 40	,,
,,	30 07 19.2	23 33 04.1	61 05 32	32 06	25 47	S	10	30.1	—9	61 26 51.7	30 56 39.5	110 53 51	,,
,,	30 16 13	23 41 58.1	61 09 21	32 40	25 51	S	10	30.1	—9	61 30 49	31 04 24	110 36 30	,,
,,	30 16 28.7	23 42 13.8	61 09 22.6	32 41	25 51.1	B	10	30.1	—9	61 39 51	31 04 29.3	110 33 52	,,
17	28 18 01	21 44 00.6	71 52 36	21 28.9	23 26.7	B	10	30.31	—5	72 08 46.6	29 07 51	110 57 76	,,
,,	28 18 02	21 44 01.2	71 52 11	21 28.9	23 26.7	P	10	30.31	—5	72 08 19	29 06 56.7	110 43 52.5	,,
,,	28 18 07.3	21 44 06.2	71 52 26	21 29.3	23 27	S	10	30.31	—5	72 08 36.3	29 07 29.5	110 50 50	,,
,,	28 21 14	21 47 13.3	71 54 18.2	21 39.6	23 34.3	H	11	30.31	—5	72 10 23.8	29 11 17	110 00 55.5	,,
,,	28 25 45	21 51 44.3	71 56 28	21 55.5	23 44.4	P	10	30.31	—5	72 12 26.2	29 15 35.8	110 57 52.5	,,
,,	28 25 45	21 51 44.3	71 56 14.7	21 55.5	23 44.4	B	10	30.31	—5	72 12 27.6	29 15 35	110 57 40	,,
,,	28 25 45	21 51 44.3	71 56 17.8	21 55.5	23 44.4	S	10	30.31	—5	72 12 19.6	29 15 19	110 53 40	,,
,,	28 31 10.5	21 57 09.9	71 58 41.2	22 14.8	23 56.4	H	10	30.31	—5	72 14 35	29 20 04	110 43 31.5	,,
,,	28 34 28	22 00 37.4	72 00 36	22 27.15	24 03.7	P	10	30.31	—5	72 16 26.6	29 24 00.7	110 50 49.5	,,
,,	28 34 38.2	22 00 37.7	72 00 45	22 27.2	24 03.7	B	10	30.31	—5	72 16 37	29 24 20.5	110 55 42	,,
,,	28 34 38.2	22 00 37.5	72 00 28.7	22 27.2	24 03.7	S	10	30.31	—5	72 16 20	29 23 44	110 46 37.5	,,
,,	28 39 45.3	22 05 44.8	72 03 24.5	22 38.3	24 10.2	H	10	30.31	—5	72 19 10.2	29 29 43.7	110 39 43.5	,,
,,	28 44 34	22 10 32.5	72 05 27.4	23 01.75	24 23.5	S	10	30.31	—5	72 21 08.8	29 33 50	110 49 22.5	,,
,,	28 44 50.7	22 10 50.3	72 05 56.8	23 02.7	24 23.8	B	10	30.31	—5	72 21 13.5	29 34 01	110 47 41	,,
,,	28 45 16	22 11 15.6	72 06 01	23 04.	24 24.9	P	11	30.31	—5	72 21 38	29 34 54.4	110 54 42	,,
,,	28 48 44	22 14 43.6	72 07 56.7	23 15.6	24 31.5	H	10	30.31	—5	72 23 32	29 38 54	110 02 36	,,
,,	28 52 55.9	22 18 55.6	72 09 46.7	23 30.2	24 39.3	B	9	30.31	—5	72 25 14	29 42 28	110 53 06	,,
,,	28 53 04	22 19 03.5	72 09 39.25	23 30.75	24 39.75	S	8	30.31	—5	72 25 13.25	29 42 26	110 50 37.5	,,
,,	28 53 21	22 19 20.7	72 09 58	23 30.7	24 39.7	P	9	30.31	—5	72 25 29.4	29 43 02.2	110 55 22.5	,,
,,	29 19 41.7	22 45 41.5	72 22 42.5	25 06.6	25 22.6	B	10	30.31	—5	72 37 59.4	30 09 18.5	110 54 15	,,

	,,	29 19 41.7	22 45 41.5	72 22 33	25 06.6	25 22.6	S	10	30.31	−5	72 37 50.3	30 08 59	110 49 22	,,
	,,	29 20 06	22 46 05.8	72 22 57	25 08.2	25 22.8	P	11	30.31	−5	72 38 11.4	30 09 42.7	110 54 13.5	,,
	,,	29 35 55	23 01 55	72 30 24.2	26 06.7	25 42.7	H	10	30.31	−5	72 45 34.4	30 25 15.5	110 50 00	,,
	,,	29 37 09	23 03 08.9	72 31 06	26 11	25 44	P	10	30.31	−5	72 46 14.4	30 26 37.1	110 52 03	,,
	,,	29 37 14	23 03 13.7	72 31 09.6	26 11.4	25 44.1	B	11	30.31	−5	72 46 16	30 26 43.3	110 52 22	,,
	,,	29 37 14	23 03 13.7	72 31 05	26 11.4	25 44.1	S	11	30.31	−5	72 46 17.8	30 26 48	110 53 45	,,
	,,	29 46 38.3	23 12 38.4	72 36 06.1	26 44.7	25 53.6	H	10	30.31	−5	72 51 12.2	30 37 06.8	111 07 06	,,
	,,	29 46 48	23 12 48.5	72 35 46.7	26 45.5	25 53.7	S	10	30.31	−5	72 51 00.2	30 36 41.5	110 58 15	,,
	,,	29 47 34	23 13 34	72 36 11	26 48	25 53.9	P	12	30.31	−5	72 51 16.6	30 37 11.8	110 54 27	,,
	,,	29 47 37	23 13 36.9	72 36 00	26 48.3	25 53.9	B	12	30.31	−5	72 51 11.6	30 37 05.4	110 52 07	,,
	,,	29 55 58	23 21 58.5	72 40 03.4	27 21.5	26 01	S	10	30.31	−5	72 55 17.4	30 45 43	110 56 07.5	,,
	,,	29 56 14.7	23 22 14.8	72 40 12.1	27 21.9	26 01	H	10	30.31	−5	72 55 23	30 45 55	110 55 03	,,
	,,	29 56 24.6	23 22 24.5	72 40 12	27 22.3	26 01.5	B	11	30.31	−5	72 55 24.5	30 45 58.5	110 53 30	,,
	,,	29 56 42	23 22 42.2	72 40 22	27 22.5	26 01.5	P	10	30.31	−5	72 55 28	30 45 59.7	110 49 22.5	,,
	,,	30 09 25.5	23 35 25.5	72 46 22.6	28 11.2	26 09	S	10	30.31	−5	72 01 40.3	30 59 09	110 55 52	,,
	,,	30 09 47	23 35 47.3	72 46 36	28 13.4	26 09	P	11	30.31	−5	73 01 50	30 59 22.5	110 53 48	,,
	,,	30 10 13.1	23 36 13.1	72 46 43.8	28 13.9	26 09.2	B	10	30.31	−5	73 02 02	30 59 56	110 55 43	,,
	,,	30 18 14	23 44 14.4	72 50 36	28 42.9	26 12.8	P	10	30.31	−5	73 05 53	31 07 52.9	110 54 37.5	,,
	,,	30 18 14	23 44 14.4	72 50 32.6	28 42.9	26 12.8	S	10	30.31	−5	73 05 53.8	31 08 03	110 57 09	,,
	,,	30 18 39.4	23 44 39.5	72 50 41	28 44.7	26 12.9	B	11	30.31	−5	73 06 06	31 08 18	110 54 37	,,
	,,	30 26 45	23 52 45.5	72 54 37	29 16.3	26 14.5	P	12	30.31	−5	73 09 57.4	31 16 26.3	110 55 12	,,
	,,	30 26 45.6	23 52 45.8	72 54 22.9	29 16.3	26 14.5	S	10	30.31	−5	73 09 51	31 16 23	110 54 18	,,
	,,	30 26 45.9	23 52 46.1	72 54 19.5	29 16.3	26 14.5	B	10	30.31	−5	73 09 46	31 16 12.7	110 51 39	,,
	18	6 44 04.7	0 10 08.7	73 02 27.7	30 21.6	26 14	R	10	30.31	−3	73 18 06	7 33 54	110 56 19.5	,,
	,,	6 51 12.1	0 17 16.1	73 05 40	30 49.3	26 13	R	10	30.31	−3	73 21 24.6	7 40 53	110 54 13.5	,,
	,,	7 01 59.5	0 28 00.2	73 10 37.2	31 29.7	26 08.3	B	11	30.31	−5	73 26 37	7 51 43.7	110 56 00	,,
	,,	7 02 23.5	0 28 24	73 10 44.3	31 31	26 08	S	10	30.31	−5	73 26 46	7 52 02	110 54 30	,,
	,,	7 02 33	0 28 32.8	73 11 09	31 29.2	26 08	P	13	30.31	−5	73 27 04	7 52 21.1	110 57 04.5	,,
	,,	7 09 45.7	0 35 46.6	73 14 04	31 57.4	26 08.7	B	10	30.31	−5	73 30 14	7 59 21	110 53 36	,,
	,,	7 09 45.7	0 35 46.6	73 14 09.3	31 57.4	26 03.7	S	10	30.31	−5	73 30 17	7 59 29.5	110 55 43.5	,,
	,,	7 10 21	0 36 20.9	73 14 29	31 59.7	26 03.3	P	12	30.31	−5	73 30 35	7 59 45.2	110 51 04.5	,,
	,,	7 17 24.2	0 43 24.7	73 37 31.6	32 24	25 58	S	10	30.31	−5	73 33 54	8 07 05	110 55 05.5	,,

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1820	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″	
April 18	7 17 57.6	0 43 58.6	73 17 51	32 27.3	25 57.8	B	11	30.31	−5	73 34 12.6	8 07 44.7	110 56 81 W	D From Sun, West
,,	7 18 02	0 44 01.9	73 18 03	32 27.4	25 57.8	P	12	30.31	−5	73 34 20.2	8 07 39.7	110 51 58.5	,,
,,	7 25 31.4	0 51 32.4	73 21 13.5	32 54.8	25 51.2	B	10	30.31	−5	73 37 46	8 15 14	110 55 24	,,
,,	7 25 31.4	0 51 32.4	73 21 08.9	32 54.8	25 51.2	S	10	30.31	−5	73 37 46.5	8 15 14.5	110 55 32	,,
,,	7 26 11	0 52 11	73 21 38	32 57	25 50.6	P	12	30.31	−5	73 38 08.2	8 15 39	110 50 45	,,
,,	7 32 24.4	0 58 25.4	73 24 10.3	33 19.5	25 44.5	S	10	30.31	−5	73 40 54.8	8 21 53	110 51 54	,,
,,	7 32 33.2	0 58 34.4	73 24 20.2	33 20.1	25 44.5	B	11	30.31	−5	73 41 04.5	8 22 11	110 54 09	,,
,,	7 32 56	0 58 56.1	73 24 34	33 21.4	25 44	P	12	30.31	−5	73 41 06.8	8 21 54	110 44 28.5	,,
,,	7 39 41	1 05 42	73 27 27.4	33 45	25 36	S	10	30.31	−5	73 44 26.2	8 29 18	110 54 00	,,
,,	7 40 21.6	1 06 22.9	73 27 45.3	33 47.3	25 35.3	B	10	30.31	−5	73 44 35.8	8 29 37	110 48 41	,,
,,	7 40 22	1 06 22.2	73 27 52	33 44	25 35.3	P	10	30.31	−5	73 44 43.8	8 29 30.4	110 47 03.3	,,
,,	7 49 27	1 15 31	73 32 09.7	34 17.3	25 23.5	R	10	30.31	−3	73 49 21.4	8 39 41	110 57 30	,,
,,	7 54 36.4	1 20 40.4	73 34 24	34 32.1	25 17.5	R	10	30.31	−3	73 51 43.4	8 44 41.5	111 00 16.5	,,
,,	8 02 41.5	1 28 42.5	73 37 27	35 02	25 04	S	10	30.31	−5	73 55 09	8 51 55	110 48 07.5	,,
,,	8 02 59.9	1 29 01.4	73 37 28.4	35 03.1	25 03.5	B	11	30.31	−5	73 55 10	8 51 57.5	110 44 02	,,
,,	8 03 05	1 29 05.4	73 37 53	35 03.3	25 03.5	P	11	30.31	−5	73 55 27.8	8 52 03.5	110 44 31.5	,,
,,	8 11 31.2	1 37 32.9	73 41 27	35 32.6	24 49.2	B	10	30.31	−5	73 59 29.5	9 01 04.3	110 52 51	,,
,,	8 11 31.2	1 37 31.9	73 41 22.4	35 32.6	24 49.2	S	10	30.31	−5	73 59 25	9 00 55	110 50 46	,,
,,	8 12 06	1 38 06.5	73 41 54	35 34.4	24 48.1	P	12	30.31	−5	73 59 50.6	9 01 48.5	110 55 30	,,
,,	8 26 24.5	1 52 26	73 47 44.3	36 20.6	24 21.6	B	10	30.31	−5	74 06 22	9 15 35.2	110 47 17	,,
,,	8 26 24.5	1 52 25	73 47 40.9	36 20.6	24 21.6	S	10	30.31	−5	74 06 17	9 15 25	110 45 00	,,
,,	8 26 41	1 52 41.6	73 48 16	36 22	24 23	P	13	30.31	−5	74 06 46	9 16 21.2	110 54 54	,,
,,	8 35 06	2 01 06.8	73 52 00	36 49.8	24 03.8	P	10	30.31	−5	74 10 54	9 25 02.3	110 58 52.5	,,
,,	8 35 06	2 01 07	73 51 31.1	36 49.8	24 03.8	B	10	30.31	−5	74 10 29	9 24 16.6	110 47 16	,,
,,	8 35 06	2 01 06.8	73 51 32.8	36 49.8	24 03.8	S	10	30.31	−5	74 10 30.3	9 24 20	110 48 16.5	,,
,,	8 44 24.7	2 10 26.2	73 55 40	37 17	23 43.5	B	10	30.31	−5	74 15 02	9 33 53.3	110 51 46	,,
,,	8 44 24.7	2 10 25.2	73 55 39	37 17	23 43.5	S	10	30.31	−5	74 15 03.5	9 33 56	110 52 48	,,

	„	8	44	39	2	10	39.8	73	56	11	37	17.7	23 43	P	10	30.31	−5	74 15 30	0 34 42.4	111 00 39	„
	20	29	24	24.9	22	51	00.9	105	45	02.8	8	25.5	26 31.3	H	11	29.8	Zero	105 52 28.5	30 13 14.5	110 33 24	„
	„	29	36	30	23	03	06.15	105	51	29.5	8	58	26 45.5	H	10	29.8	„	105 58 24.8	30 26 22	110 48 58.5	„
	„	29	42	26.5	23	09	02.7	105	54	31.1	9	14.6	26 50.6	H	10	29.8	„	106 01 15.6	30 32 39.4	110 54 10.5	„
	„	29	53	04.8	23	19	41.1	105	59	38.8	9	45	27 00.8	H	10	29.8	„	116 05 54.2	30 43 01.5	110 50 06	„
	„	29	57	54.75	23	24	31.1	106	01	55.1	9	59.4	27 08.7	H	10	29.8	„	106 07 56.9	30 47 26.7	110 43 54	„
	„	30	08	47.9	23	35	24.3	106	07	09.8	10	32.2	27 10.6	H	10	29.8	„	106 12 51.5	30 58 18	110 43 25.5	„
	„	30	15	06.3	23	41	42.75	106	10	14.5	10	51.7	27 13.3	H	10	29.8	„	106 15 44.6	31 04 48.5	110 44 27	„
	„	30	25	04.8	23	51	41.35	106	15	09.2	11	23.4	27 15.9	H	10	29.8	„	106 20 04.5	31 14 15	110 38 25.5	„
	„	30	32	34	23	59	10.6	106	18	41.1	11	47	27 16.5	H	10	29.8	„	106 23 41.4	31 22 14.5	110 45 58.5	„
	21	6	41	50.5	0	08	27.1	106	23	05.3	12	24.6	27 16	H	10	29.8	„	106 27 48.3	7 31 20.4	110 43 19.5	„
	„	6	46	11.5	0	12	48.2	106	25	09.4	12	31.5	27 15.2	H	11	29.8	„	106 29 49.7	7 35 49	110 45 12	„
	„	6	56	56	0	23	32.8	106	29	54.8	13	08	27 11.8	H	10	29.8	„	106 34 21.4	7 45 49.2	110 34 06	„
	„	7	01	47.5	0	28	24.5	106	32	22.3	13	22.75	27 09.25	S	10	29.8	„	106 36 43	7 51 03	110 39 37.5	„
	„	7	01	47.5	0	28	25.2	106	32	31	13	22.75	27 09.25	P	10	29.79	„	106 36 52.4	7 51 24.1	110 44 43.5	„
	„	7	02	07.8	0	28	44.5	106	32	18	13	24	27 08.4	B	11	29.8	„	106 36 39.2	7 50 54	110 32 22	„
	„	7	02	19.4	0	28	56.2	106	32	35.6	13	26	27 09.2	H	10	29.8	„	106 36 55.8	7 51 36.6	110 48 06	„
	„	7	10	40.8	0	37	17.8	106	36	33.4	13	54	27 04	S	11	29.8	„	106 40 45	7 59 59	110 40 18	„
	„	7	10	47.8	0	37	24.6	106	36	25	13	54.2	27 03.9	B	11	29.8	„	106 40 37	7 59 39	110 33 36	„
	„	7	10	59.1	0	37	36.1	106	36	42	12	54.8	27 03.7	P	12	29.8	„	106 40 53	8 00 57.8	110 40 25.5	„
	„	7	15	21	0	41	58	106	38	39.5	14	10	27 00.6	H	10	29.8	„	106 42 48	8 04 28.9	110 37 43.5	„
	„	7	19	16.4	0	45	53.3	106	40	33.1	14	24.2	26 57.2	B	10	29.8	„	106 44 39.4	8 08 35	110 40 25	„
	„	7	19	16.4	0	45	53.3	106	40	35.7	14	24.2	26 57.2	S	10	29.8	„	106 44 42	8 08 41	110 41 55	„
	„	7	19	17.2	0	45	54.2	106	40	39	14	24.2	26 57.2	P	10	29.8	„	106 44 45	8 08 50.7	110 44 07.5	„
	„	7	19	34.4	0	46	11.5	106	40	36.9	14	25.2	26 57	H	10	29.8	„	106 44 42.5	8 08 42	110 37 37.5	„
	„	7	26	38.6	0	53	15.6	106	43	50	14	51	23 50.5	B	11	29.8	„	106 47 50	8 15 37	110 35 21	„
	„	7	26	43	0	53	20.1	106	44	08	14	51.2	26 50.3	P	11	29.8	„	106 48 08	8 16 19.6	110 44 52.5	„
	„	7	26	56.7	0	53	33.7	106	43	51.4	14	52.8	26 50.1	S	10	29.8	„	106 47 52	8 15 42	110 32 05	„
	„	7	28	17	0	54	54.1	106	44	39.4	14	57	26 48.7	H	10	29.8	„	106 48 41	8 17 30	110 38 58.5	„
	„	7	32	14.5	0	58	51.6	106	46	32.8	15	11	26 44.7	H	10	29.8	„	106 50 29.4	8 21 29.8	110 39 33	„
	„	7	33	32.5	1	00	09.5	106	47	06.6	15	15.5	26 43.3	S	10	29.8	„	106 51 03	8 22 45	110 38 22.5	„
	„	7	33	53.6	1	00	30.7	106	47	17.6	15	16.7	26 43	B	10	29.8	„	106 51 13.2	8 23 07.5	110 39 12	„

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1820	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes		Observer.	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
				Moon's centre	Sun's centre, or Star								
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″ W	☽ From Sun West
April 21	7 34 01.9	1 00 39	106 47 21	15 17.1	26 42.9	P	12	29.8	Zero	106 51 17	8 23 17.6	110 39 39	
,,	7 41 27.4	1 08 04.6	106 50 43.6	15 42.7	26 34.6	H	10	29.8	,,	106 54 35.5	8 30 33.6	110 37 15	,,
,,	7 41 30.5	1 08 06.6	106 50 47.1	15 43.3	26 34	S	10	29.8	,,	106 54 38	8 30 31	110 36 06	,,
,,	7 41 39.2	1 08 16.3	106 50 50	15 43.4	26 34	B	10	29.8	,,	106 54 41.2	8 30 47	110 37 40	,,
,,	7 41 39.9	1 08 17	106 51 02	15 43.4	26 34	P	10	29.8	,,	106 54 53	8 31 15.2	110 44 33	,,
,,	7 45 54.4	1 12 31.6	106 52 52.7	15 58	26 28.8	H	11	29.8	,,	106 56 42.8	8 35 15	110 40 51	,,
,,	7 49 27.7	1 16 0.49	106 54 24.6	16 11.1	26 24.1	B	10	29.8	,,	106 58 15	8 38 40	110 38 46	,,
,,	7 49 28	1 16 05.1	106 53 31.8	16 11.1	26 24.1	S	10	29.8	,,	106 58 24	8 39 00	110 43 43.5	,,
,,	7 49 28.8	1 16 06	106 54 37	16 11.1	26 24.1	P	10	29.8	,,	106 58 28	8 39 10.7	110 46 10.5	,,
,,	7 53 50	1 20 27.3	106 56 26.2	16 27.1	26 17.2	H	10	29.8	,,	107 00 16.3	8 43 08.3	110 40 15	,,
,,	7 55 59.8	1 22 37	106 57 21.6	16 34.9	26 14.7	B	10	29.8	,,	107 01 10	8 45 07	110 37 30	,,
,,	7 56 00	1 22 37.2	106 57 32.9	16 34.9	26 14.7	S	10	29.8	,,	107 01 21	8 45 52	110 43 45	,,
,,	7 56 00.5	1 22 37.7	106 57 41	16 34.9	26 14.7	P	10	29.8	,,	107 01 28.6	8 45 50	110 48 0.45	,,
,,	7 58 30.2	1 25 07.6	106 58 31.9	16 44	26 10.7	H	10	29.8	,,	107 02 20.4	8 47 42.8	110 38 43.5	,,
,,	8 03 15	1 29 52.1	107 00 45.5	17 00.7	26 02.8	S	10	29.8	,,	107 04 35.6	8 52 43	110 42 43.5	,,
,,	8 03 15.2	1 29 52.4	107 01 01	17 00.7	26 02.8	P	10	29.8	,,	107 04 50.2	8 53 16	110 50 54	,,
,,	8 03 30.2	1 30 07.5	107 00 49	17 01.6	26 02.4	B	9	29.8	,,	107 04 36	8 52 42	110 38 37	,,
,,	8 08 56.7	1 35 34.2	107 03 16.6	17 21.1	25 53.4	H	10	29.8	,,	107 07 05.8	8 58 13.5	110 39 49.5	,,
,,	8 09 37.6	1 36 14.9	107 03 41.3	17 23.9	25 52.2	B	10	29.8	,,	107 07 29	8 59 05	110 42 40	,,
,,	8 09 38	1 36 15.5	107 03 36.5	17 23.9	25 52.2	S	10	29.8	,,	107 07 26	8 58 58	110 40 37.5	,,
,,	8 09 38.3	1 36 16	107 03 54	17 23.9	25 52.2	P	10	29.8	,,	107 07 43	8 59 38	110 50 30	,,
,,	8 14 13.6	1 40 51.1	107 05 37.8	17 40.7	25 45.3	H	10	29.8	,,	107 09 27.7	9 03 27.2	110 39 01.5	,,
,,	8 16 22	1 42 59.4	107 06 42.4	17 48.6	25 40.3	B	10	29.8	,,	107 10 31	9 05 47	110 41 54	,,
,,	8 16 22	1 42 59.5	107 06 42.9	17 48.6	25 40.4	S	10	29.8	,,	107 10 34	9 05 54	110 43 37.5	,,
,,	8 16 22.4	1 43 00.1	107 06 47	17 48.7	25 40.4	P	10	29.8	,,	107 10 37	9 06 02.8	110 45 40.5	,,
,,	8 22 53.3	1 49 31	107 09 37	18 12.2	25 27.6	S	10	29.8	,,	107 13 30	9 12 23	110 43 00	,,
,,	8 22 53.8	1 49 31.7	107 09 42	18 12.2	25 27.6	P	10	29.8	,,	107 13 35	9 12 34.1	110 45 36	,,

	„	8 23 09	1 49 46.4	107 09 34.7	18 13.2	25 27.5	B	11	29.8	„	107 13 26	9 12 14.1	110 36 52	„
	„	8 29 34.7	1 56 12.2	107 12 31.5	18 36.5	25 14.5	B	10	29.8	„	107 16 24.6	9 18 49	110 39 12	„
	„	8 29 35.1	1 56 12.6	107 12 25.9	18 36.5	25 14.5	S	10	29.8	„	107 16 19	9 18 37	110 36 24	„
	„	8 29 35.7	1 56 13.6	107 12 45	18 36.5	25 14.4	P	10	29.8	„	107 16 41	9 19 25.5	110 47 58.5	„
	„	8 32 05.1	1 58 42.7	107 13 19.7	18 45.5	25 09.2	H	10	29.8	„	107 17 16	9 20 42.8	110 30 01.5	„
	„	8 37 00.8	2 03 38.3	107 15 56.6	19 03.5	24 59	S	10	29.8	„	107 19 55	9 26 34	110 43 55	„
	„	8 37 01.3	2 03 39.2	107 16 03	19 03.5	24 59	P	10	29.8	„	107 20 02.2	9 26 50.4	110 47 48	„
	„	8 37 16.5	2 03 54	107 15 59	19 04.5	24 58.4	B	9	29.8	„	107 19 56	9 26 36.5	110 40 37	„
	„	8 37 59.8	2 04 37.4	107 15 57.5	19 07	24 56.9	H	10	29.8	„	107 19 57.8	9 26 40.6	110 30 48	„
	„	8 44 18	2 10 55.6	107 19 05.4	19 30.1	24 42.8	B	10	29.8	„	107 23 06.8	9 33 38.5	110 40 43	„
	„	8 44 18.5	2 10 56.2	107 19 08.1	19 30.1	24 42.8	S	10	29.8	„	107 23 10	9 33 45.5	110 42 20	„
	„	8 44 18.8	2 10 56.8	107 19 19	19 30.1	24 42.1	P	10	29.8	„	107 23 22	9 34 12.1	110 48 49.5	„
	„	8 50 34.7	2 17 12.4	107 21 43.7	19 53.1	24 28.3	H	10	29.8	„	107 25 52	9 39 43.9	110 37 52.5	„
	„	8 54 23	2 21 00.6	107 23 12.2	20 07	24 19.1	B	10	29.8	„	107 27 24.8	9 43 09	110 32 06	„
	„	8 54 23.5	2 21 01.5	107 23 52	20 07	24 19.1	P	10	29.8	„	107 28 03	9 44 33.4	110 52 58.5	„
	„	8 54 54	2 21 31.7	107 23 22	20 09	24 17.8	S	10	29.8	„	107 27 40.2	9 43 43	110 32 50	„
	„	8 56 46.9	2 23 24.8	107 24 23.8	20 19.7	24 13	H	10	29.8	„	107 28 36	9 45 46.8	110 35 30	„
	„	9 01 18.9	2 27 56.6	107 26 09	20 31.8	24 02.2	B	10	29.8	„	107 30 26.8	9 49 49.7	110 28 16	„
	„	9 01 19	2 27 56.7	107 26 14.5	20 31.8	24 02.2	S	10	29.8	„	107 30 33	9 50 05	110 32 05	„
	„	9 01 19.3	2 27 57.5	107 26 44	20 31.8	24 02.2	P	10	29.8	„	107 31 03.6	9 51 12.8	110 48 49.5	„
	„	9 06 51.3	2 33 29.3	107 28 49.4	20 51.7	23 48.4	H	10	29.8	„	107 33 11.7	9 55 56.5	110 37 19.5	„
	„	9 09 20.1	2 35 57.7	407 29 49.5	21 00.7	23 42	B	10	29.8	„	107 34 14	9 58 14	110 34 05	„
	„	9 09 20.2	2 35 58.2	107 29 41.4	21 00.7	23 42	S	10	29.8	„	107 34 08	9 58 0	110 30 27	„
	„	9 09 20.3	2 35 58.6	107 30 14	21 00.7	23 42	P	10	29.8	„	107 34 40	9 59 11.4	110 48 12	„
	„	9 10 55	2 37 33	107 30 23.2	21 06.5	23 37.8	H	10	29.8	„	107 34 50.5	9 59 35	110 30 30	„
	„	9 17 46.9	2 44 25.3	107 33 54	21 31	23 19.1	P	10	29.8	„	107 38 30	10 07 40	110 48 40.5	„
	„	9 17 46.9	2 44 24.7	107 33 35.9	21 31	23 19.1	B	10	29.8	„	107 38 10.6	10 06 57	110 38 17	„
	„	9 17 46.9	2 44 25	107 33 18	21 31	23 19.1	S	10	29.8	„	107 37 54	10 06 19	110 28 0	„
	„	9 24 57.8	2 51 35.7	107 36 33.8	21 56.7	22 59.2	B	10	29.8	„	107 41 18	10 13 51.4	110 33 55	„
	„	9 24 58	2 51 36	107 36 27.5	21 56.7	22 59.2	S	10	29.8	„	107 41 12	10 13 28	110 30 30	„
	„	11 28 03.4	4 54 41.4	108 28 09	28 22	15 59	R	10	29.8	−7	108 37 29	12 18 08.5	110 51 46.5	„
	„	11 35 15.7	5 01 53.7	108 31 02	28 39.3	15 31.1	R	10	29.8	−7	108 40 53.4	12 25 39.7	110 56 30	„

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1820	Time by 259	Apparent Time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phenomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″	
April 21	11 45 31	5 12 10.2	108 34 38.6	29 03.5	14 51.4	S	10	29.8	−5	108 45 06	12 34 59.5	110 42 20 W	D From Sun, West
,,	11 46 08.9	5 12 48	108 35 10	29 05.9	14 49	P	10	29.8	−5	108 45 37	12 36 08.4	110 50 06	,,
,,	11 46 12.1	5 12 51.3	108 34 57	29 05.9	14 48.8	B	9	29.8	−7	108 45 26	12 35 43.6	110 43 05	,,
,,	11 54 50.1	5 21 29.2	108 38 37	29 26	14 15.4	P	11	29.8	−5	108 49 33.4	12 44 51	110 50 27	,,
,,	11 54 50.3	5 21 29.6	108 38 18	29 26	14 15.4	B	11	29.8	−7	108 49 16	12 44 12.7	110 40 46	,,
,,	11 55 10.5	5 21 49.7	108 38 27.4	29 27	14 14	S	10	29.8	−5	108 49 23	12 44 28	110 39 35	,,
,,	12 03 16	5 29 55.3	108 41 40.6	29 44.1	13 43	B	10	29.8	−7	108 53 08	12 52 46	110 42 40	,,
,,	12 03 32.2	5 30 11.4	108 41 46.4	29 44.7	13 42	S	11	29.8	−5	108 53 14	12 52 59	110 41 53	,,
,,	12 03 32.6	5 30 11.7	108 42 03	29 44.7	13 42	P	11	29.8	−5	108 53 26.6	12 53 27.8	110 49 01.5	,,
,,	12 11 23.7	5 38 01.7	108 44 59	30 00	13 11.2	R	10	29.8	−7	108 56 54	13 01 07	110 46 16.5	,,
,,	12 19 49.3	5 46 28.7	108 48 15	30 15.8	12 38	P	10	29.8	−5	109 00 40	13 09 26.4	110 44 25.5	,,
,,	12 19 49.5	5 46 28.9	108 48 02	30 15.8	12 38	B	10	29.8	−7	109 00 27	13 08 57.2	110 37 06	,,
,,	12 19 49.5	5 46 29	108 48 07.5	30 15.8	12 38	S	10	29.8	−5	109 00 32.5	13 09 10	110 40 15	,,
,,	12 [illegible]	5 54 04.2	108 51 22	30 29.7	12 08.4	P	10	29.8	−5	109 04 17.2	13 17 27	110 50 42	,,
,,	12 [illegible] 24.9	5 54 04.3	108 50 51	30 29.7	12 08.4	B	10	29.8	−7	109 03 50	13 16 26.5	110 35 38	,,
,,	12 27 25	5 54 04.5	108 51 05.1	30 29.7	12 08.4	S	10	29.8	−5	109 04 04	13 16 58	110 42 22.5	,,
,,	12 34 50.9	6 01 30.6	108 53 58.3	30 41.7	11 39.8	S	10	29.8	−5	109 07 24	13 24 20	110 42 21	,,
,,	12 34 50.9	6 01 30.6	108 54 10	30 41.7	11 39.8	P	10	29.8	−5	109 07 36	13 24 46.9	110 49 04.5	,,
,,	12 41 38.8	6 08 18.5	108 57 01	30 52.4	11 13.5	P	10	29.8	−5	109 10 52.6	13 32 02.3	110 55 57	,,
,,	12 41 39	6 08 18.5	108 56 50	30 52.4	11 13.5	S	10	29.8	−5	109 10 41.6	13 31 37	110 49 37.5	,,
,,	12 49 34.8	6 16 14.5	109 00 03	31 03.2	10 39.8	P	10	29.8	−7	109 14 32	13 40 07.3	110 58 12	,,
,,	12 49 35	6 16 14.5	108 59 43.5	31 03.2	10 39.8	S	10	29.8	−7	109 14 13	13 39 25	110 47 37.5	,,
,,	12 59 04	6 25 43.7	109 03 32	31 15.1	10 04.7	P	10	29.8	−7	109 18 46	13 49 29.3	110 53 54	,,
,,	12 59 04	6 25 43.7	109 03 15.6	31 15.1	10 04.7	S	10	29.8	−7	109 18 30	13 48 53	110 47 20	,,
,,	13 06 22 6	6 33 02.3	109 06 09	31 23.6	9 38.5	P	10	29.8	−7	109 21 55.4	13 56 28.3	110 51 30	,,
,,	13 06 22.6	6 33 02.3	109 06 06	31 23.6	9 38.5	S	10	29.8	−7	109 21 52	13 56 22	110 49 55	,,
May 7	27 43 32	21 12 53.5	48 30 57	13 50.6	28 12.5	P	11	29.98	+6	48 40 12.2	28 34 54.6	110 30 16.5	D From Sun, East

	,,	27 52 39.8	21 22 01.1	48 26 36	13 49.8	28 37.8	P	10	29.98	+6	48 35 20.6	28 43 37	110 23 55.5.	D From Sun, East
	,,	27 52 39.8	21 21 57.2	48 26 43	13 49.8	28 37.8	B	10	29.98	+1	48 35 27	28 43 26	110 22 12	,,
	,,	28 04 14.8	21 33 36.4	48 20 50.5	13 47.8	29 08.6	P	12	29.98	+6	48 28 55	28 55 10.9	110 23 37.5	,,
	,,	28 05 04.8	21 34 22.2	48 20 22.7	13 47	29 10.6	B	10	29.98	+1	48 28 27.2	28 56 02	110 24 57	,,
	,,	28 13 01.7	21 42 23.3	48 16 22	13 43.1	29 30.7	P	10	29.98	+6	48 23 58.2	29 04 04.5	110 25 18.5	,,
	,,	28 13 01.7	21 42 19.2	48 16 18.5	13 43.1	29 30.7	B	10	29.98	+1	48 23 56.6	29 04 07.5	110 27 04.5	,,
	,,	28 23 19.2	21 52 40.9	48 10 26.4	13 37	30 04	R	10	29.98	Zero	48 17 22	29 15 58.5	111 49 24	,,
	,,	28 32 59.4	22 02 21.1	48 06 21.3	13 31	30 16.7	P	11	29.98	+6	48 12 56.1	29 23 55.8	110 23 40.5	,,
	,,	28 32 59.8	22 02 17.3	48 06 23.6	13 31	30 16.5	B	10	29.98	+1	48 12 58	29 23 52.5	110 23 48	,,
	,,	28 41 29.1	22 10 50.8	48 01 48	13 22.7	30 34.5	P	11	29.98	+6	48 07 55.2	29 32 56.8	110 31 30	,,
	,,	28 41 34.9	22 10 52.3	48 01 57.7	13 22.6	30 34.5	B	11	29.98	+1	48 08 06.5	29 32 36.5	110 26 03	,,
	15	29 00 44.8	22 30 21.8	53 08 57	27 38.6	33 09.4	P	11	30.31	+17	53 22 35.8	29 54 06.2	110 56 06	D From Sun, West
	,,	29 00 55.7	22 30 30.2	53 08 32.4	27 39.1	33 09.7	S	10	30.31	+17	53 22 13.7	29 53 18	110 41 57	,,
	,,	29 08 30	22 38 04.5	53 12 06.3	28 06.5	33 22.1	S	11	30.31	+17	53 25 51.6	30 00 58	110 43 22.5	,,
	,,	29 08 32.1	22 38 09.1	53 12 28	28 06.5	33 22.1	P	11	30.31	+17	53 26 11.4	30 01 39.7	110 52 39	,,
	,,	29 15 30.9	22 45 07.9	53 15 37	28 33	33 32.9	P	10	30.31	+17	53 29 34	30 08 25.2	110 49 19.5	,,
	,,	29 15 31	22 45 05.5	53 15 23	28 33	33 32.9	S	10	30.31	+17	53 29 13.3	30 08 02	110 44 07.5	,,
	,,	29 17 31	22 47 06	53 16 10.4	28 45.8	33 37.3	H	10	30.31	+17	53 30 01	30 09 43.5	110 39 22.5	,,
	,,	29 21 46.2	22 51 23.2	53 18 12	28 56.7	33 41.5	P	10	30.31	+17	53 32 05	30 14 03.6	110 30 06	,,
	,,	29 21 46.5	22 51 21	53 17 59	28 56.8	33 41.5	S	10	30.31	+17	53 31 53.8	30 13 41	110 35 0	,,
	,,	29 25 07.3	22 54 40.3	53 19 24.2	29 07.8	33 45.8	H	10	30.31	+17	53 33 19.4	30 16 42	110 30 25.5	,,
	,,	29 28 09	22 57 43.5	53 20 48.9	29 18.8	33 49.5	S	10	30.31	+17	53 34 49.4	30 19 50	110 31 37.5	,,
	,,	29 28 18.8	22 57 55.8	53 21 07	29 19.4	33 49.7	P	11	30.31	+17	53 35 09.4	30 20 31.4	110 38 54	,,
	,,	29 35 00.9	23 04 37.9	53 24 17	29 44.1	33 57.5	P	10	30.31	+17	53 38 21	30 27 18.5	110 40 09	,,
	,,	29 35 01.5	23 04 36	53 24 08.2	29 44.1	33 57.5	S	10	30.31	+17	53 38 13.5	30 27 01	110 36 15	,,
	,,	29 35 39.2	23 05 14.2	53 24 16.2	29 46.5	33 58.1	H	10	30.31	+17	53 38 21.4	30 27 18	110 30 57	,,
	,,	29 40 46.1	23 10 21.1	53 26 41.8	30 06.1	34 03.2	H	10	30.31	+17	53 40 53.5	30 32 38.7	110 34 24	,,
	,,	29 41 38.4	23 11 15.4	53 27 20	30 09.3	34 04	P	10	30.31	+17	53 41 32.4	30 33 57	110 40 24	,,
	,,	29 41 39	23 11 13.5	53 27 08.2	30 09.3	34 04	S	10	30.31	+17	53 41 22.7	30 33 40	110 36 37	,,
	,,	29 48 06.2	23 17 43.2	53 30 18	30 32.8	34 09.8	P	10	30.31	+17	53 44 39	30 40 29.8	110 41 39	,,
	,,	29 48 07	23 17 41.5	53 30 02.2	30 32.8	34 09.8	S	10	30.31	+17	53 44 26.2	30 40 05.5	110 36 00	,,
	,,	29 48 30.1	23 18 05.1	53 30 20.4	30 34.3	34 10.1	H	10	30.31	+17	53 44 40.7	30 40 37	110 37 58.5	,,

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued*.

1820	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″	
May 15	29 53 13.8	23 22 48.8	53 32 37	30 50.9	34 13.8	H	10	30.31	+17	53 47 02.6	30 45 36.5	110 41 55.5 W	D From Sun West
,,	29 55 14.1	23 24 49	53 33 35.7	30 58	34 15.2	R	10	30.20	+15	53 48 03.5	30 47 42.5	110 48 22.5	,,
,,	30 02 23.2	23 31 58.2	53 36 46	31 24.2	34 19.7	H	10	30.31	+17	53 51 25.5	30 54 50.8	110 43 09	,,
,,	30 08 26	23 38 01	53 39 37.7	31 46.5	34 22.8	H	10	30.31	+17	53 54 25.8	31 01 10.7	110 47 25.5	,,
,,	30 13 20.4	23 42 55.4	53 41 57.2	32 05.2	34 24.7	H	10	30.31	+17	53 56 54.3	31 06 23.6	110 52 03	,,
,,	30 18 33.4	23 48 08.4	53 44 23.5	32 21.4	34 26.1	H	10	30.31	+17	53 59 28.2	31 11 48.5	110 55 01.5	,,
,,	30 30 05.3	23 59 04.3	53 49 13	33 00.5	34 27.6	H	10	30.31	+17	54 04 36.6	31 22 38.7	110 44 36	,,
16	6 37 05.9	0 06 40.8	53 52 15.7	33 24.2	34 26.9	H	10	30.31	+17	54 07 50.6	7 29 27.5	110 41 40.5	,,
,,	6 42 57	0 12 31.9	53 54 54.7	33 46.8	34 26	H	10	30.31	+17	54 10 45.7	7 35 35.3	110 45 51	,,
,,	6 47 15	0 16 52	53 57 02	33 59.4	34 24.8	P	14	30.31	+17	54 13 01.4	7 40 23.5	110 52 52.5	,,
,,	6 47 32.8	0 17 07.7	53 56 46.1	34 00.9	34 24.5	H	10	30.31	+17	54 12 45.4	7 39 49.7	110 40 30	,,
,,	6 48 12.1	0 17 46.6	53 57 09.3	34 01.6	34 24.5	S	10	30.31	+17	54 13 11.1	7 40 43	110 44 06	,,
,,	6 53 49.9	0 23 26.9	53 59 53	34 20.1	34 22.2	P	10	30.31	+17	54 16 06.2	7 46 53.4	110 51 37.5	,,
,,	6 53 49.9	0 23 24.4	53 59 38.6	34 20.1	34 22.2	S	10	30.31	+17	54 15 52.9	7 46 25	110 45 09	,,
,,	6 58 59.7	0 28 34.6	54 02 05.5	34 36.5	34 19.7	H	10	30.31	+17	54 18 27.7	7 51 51.6	110 49 15	,,
,,	6 59 49.5	0 29 26.5	54 02 31	34 39.5	34 19.2	P	10	30.31	+17	54 18 56.6	7 51 52.5	110 51 30	,,
,,	6 59 49.5	0 29 24	54 02 14.8	34 39.5	34 19.2	S	10	30.31	+17	54 18 43.3	7 52 23	110 44 45	,,
,,	7 04 20.1	0 33 55	54 04 29.5	34 54.7	34 16.5	H	10	30.31	+17	54 21 04.3	7 57 21.8	110 51 42	,,
,,	7 05 52.6	0 35 29.6	54 05 12	34 59.4	34 15.5	P	11	30.31	+17	54 21 51.6	7 59 02.2	110 53 09	,,
,,	7 05 59	0 35 33.5	54 05 00.3	34 59.7	34 15.5	S	10	30.31	+17	54 21 42.3	7 58 43	110 47 22.5	,,
,,	7 10 56.7	0 40 31.6	54 07 25.5	35 14.9	34 12.1	H	10	30.31	+17	54 24 14.7	8 04 03.8	110 53 03	,,
,,	7 11 46.7	0 41 23.7	54 07 45	35 17.3	34 11.3	P	10	30.31	+17	54 24 38	8 04 53	110 52 19.5	,,
,,	7 16 22	0 45 56.9	54 09 23.4	35 31.6	34 07.3	H	10	30.31	+17	54 26 26.5	8 08 42	110 41 16.5	,,
,,	7 17 50.7	0 47 27.7	54 10 22	35 36.4	34 06	P	10	30.31	+17	54 27 30.4	8 10 57.4	110 52 25.5	,,
,,	7 17 50 7	0 47 25.2	54 10 11.4	35 36.4	34 06	S	10	30.31	+17	54 27 19.9	8 10 37	110 47 57	,,
,,	7 25 03	0 54 40	54 13 39	35 58.2	33 59.1	P	12	30.31	+17	54 31 07	8 18 33.8	110 38 27	,,
,,	7 25 12.2	0 54 46.6	54 13 25.5	35 58.7	33 58.9	S	10	30.31	+17	54 30 54.8	8 18 10	110 50 54	,,

"	7 26 03.8	0 55 38.7	54 13 34.1	36 01.2	33 57.5	H	10	30.31	+15	54 31 01.8	8 18 23	110 41 04.5	"
"	7 31 08.9	1 00 43.8	54 15 47.1	36 15.8	33 52.2	H	10	30.31	+15	54 33 27	8 23 29	110 41 18	"
"	7 32 22	1 01 56.6	54 16 32.3	36 19.4	33 50.7	S	10	30.31	+15	54 34 18.5	8 25 19	110 50 36	"
"	7 32 25.7	1 02 02.7	54 16 47	36 19.5	33 50.6	P	11	30.31	+15	54 34 30.6	8 25 23.2	110 50 07.5	"
"	7 36 51.6	1 06 26.5	54 18 17.7	36 32.3	33 45.1	H	10	30.31	+15	54 36 12.5	8 29 18.4	110 42 58.5	"
"	7 39 46	1 09 23	54 19 40	36 40.3	33 41.5	P	11	30.31	+15	54 37 43.8	8 32 31.8	110 47 12	"
"	7 39 58.5	1 09 32.8	54 19 42.3	35 40.9	33 41.3	S	10	30.31	+15	54 37 48.8	8 32 42.5	110 47 25	"
"	7 42 26.4	1 12 01.3	54 20 39.3	36 47.7	33 38.2	H	10	30.31	+15	54 38 49	8 34 49	110 41 55.5	"
"	7 47 51.6	1 17 28.6	54 23 18	37 02.7	33 30.1	P	11	30.31	+15	54 41 43.2	8 40 57.5	110 52 13.5	"
"	7 48 17	1 17 51.3	54 23 14.1	37 03.8	33 29.6	S	10	30.31	+15	54 41 42.1	8 40 57	110 46 25	"
"	7 53 07.2	1 22 42.1	54 25 10.2	37 17.1	33 22.2	H	10	30.31	+15	54 43 50	8 45 24.7	110 40 39	"
"	7 55 35.2	1 25 12.2	54 26 26	37 23.5	33 18.1	P	10	30.31	+17	54 45 14	8 48 22.8	110 47 39	"
"	7 55 35.6	1 25 09.9	54 26 13.6	37 23.5	33 18.1	S	10	30.31	+17	54 45 01.6	8 47 57	110 41 47	"
"	8 01 18.8	1 30 55.8	54 28 48	37 37.8	33 08.8	P	10	30.31	+17	54 47 52.4	8 53 58	110 45 33.5	"
"	8 01 20.2	1 30 54.5	54 28 40.2	37 37.8	33 08.8	S	10	30.31	+17	54 47 43.8	8 53 42	110 41 52	"
"	8 02 30.9	1 32 05.8	54 29 37.5	37 38	33 06.9	H	10	30.31	+17	54 48 52	8 55 41.5	110 53 55.5	"
"	8 07 38.3	1 37 13.2	54 31 42.9	37 49.9	32 57.8	H	10	30.31	+17	54 51 01.6	9 00 37	110 50 57	"
"	8 07 40.2	1 37 14.5	54 31 15.9	37 52.3	32 57.8	S	10	30.31	+17	54 50 38.5	8 59 48.5	110 38 30	"
"	8 07 40.7	1 37 17.7	54 31 30	37 52.5	32 57.7	P	10	30.31	+17	54 50 51.4	8 59 44.5	110 36 42.5	"
"	8 14 50.2	1 44 27.2	54 34 51	38 09	32 44.6	P	10	30.31	+17	54 54 82	9 08 01.5	110 52 34.5	"
"	8 14 50.2	1 44 24.5	54 34 37.5	38 09	32 44.6	S	10	30.31	+17	54 54 21.7	9 07 40	110 48 52	"
"	8 17 42.5	1 47 17.3	54 35 46.1	38 15.5	32 39.3	H	10	30.31	+17	54 55 35.4	9 10 15.5	110 44 33	"
"	8 22 01.7	1 51 38.7	54 37 54	38 25.6	32 30.3	P	10	30.31	+17	54 58 02.6	9 15 26.5	110 56 57	"
"	8 22 01.7	1 51 36	54 37 39.8	38 25.6	32 30.3	S	10	30.31	+17	54 57 45.1	9 14 49.4	110 48 21	"
"	8 23 50.6	1 52 25.4	54 38 19.7	38 27.6	32 28.5	H	10	30.31	+17	54 58 25.2	9 16 14.3	110 57 13.5	"
"	8 27 24	1 56 58.8	54 40 02	38 37.9	32 18.4	H	10	30.31	+17	55 00 32	9 20 21.1	110 50 34.5	"
"	8 28 50.8	1 58 25.2	54 40 27.9	38 41	32 15.2	S	10	30.31	+17	55 00 55.8	9 21 32.5	110 46 49.5	"
"	8 28 51	1 58 28	54 40 37	38 41	32 15.2	P	10	30.31	+17	55 01 03.6	9 21 49	110 50 15	"
"	8 32 17.5	2 01 52.3	54 41 57	38 48.8	32 07.4	H	10	30.31	+17	55 02 32.5	9 24 56.8	110 46 07.5	"
"	8 36 17.6	2 05 54.6	54 43 53	38 56.3	31 58.5	P	10	30.31	+17	55 04 43	9 29 32.5	110 54 28.5	"
"	8 36 17.6	2 05 51.9	54 43 26.3	38 56.3	31 58.5	S	10	30.31	+17	55 04 17.6	9 28 39.5	110 41 54	"
"	8 42 28.7	2 12 05.7	54 46 23	39 08.2	31 44.6	P	10	30.31	+17	55 07 31	9 35 27.5	110 50 27	"

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1820	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes — Moon's centre	Apparent Altitudes — Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich Time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″	
May 16	8 42 48.7	2 12 03	54 46 07	39 08,2	31 44.6	S	10	30.31	+17	55 07 18.8	9 35 01.5	110 44 37.5w	D From Sun Wer
,,	8 49 06.1	2 18 43.1	54 49 09	39 20.8	31 28.9	P	11	30.31	+17	55 10 40	9 42 07.5	110 51 06	,,
,,	8 49 23.4	2 19 07.7	54 48 56.1	39 21.3	31 28.1	S	10	30.31	+17	55 10 30.2	9 41 47	110 39 50	,,
,,	8 56 57.4	2 26 34.4	54 52 25	39 34.4	31 08.8	P	10	30.31	+17	55 14 21.6	9 49 55.8	110 50 21	,,
,,	8 56 57.4	2 26 31.7	54 52 05.6	39 34.4	31 08.8	S	10	30.31	+17	55 14 04.9	9 49 20	110 42 05	,,
,,	9 05 19.2	2 34 56.2	54 55 56	39 47.7	30 46.8	P	10	30.31	+17	55 18 21	9 58 22	110 51 27	,,
,,	9 05 19.2	2 34 53.5	54 55 39.3	39 47.7	30 46.8	S	10	30.31	+17	55 18 06.6	9 57 51	110 44 22.5	,,
,,	9 10 32.5	2 40 09.5	54 58 05	39 55.9	30 32.7	P	10	30.31	+17	55 20 47	10 03 30.6	110 50 16.5	,,
,,	9 10 55.3	2 40 29.6	54 57 59.5	39 55.5	30 31.6	S	10	30.31	+17	55 20 45.8	10 03 27	110 44 21	,,
,,	9 18 01	2 47 35.8	56 59 34	40 06.5	30 11.9	R	10	30.20	+15	55 24 04.6	10 10 29	110 43 18	,,
,,	12 06 39.8	5 36 14.4	56 09 01.7	39 23.6	20 10.8	R	10	30.20	+15	56 43 25.5	12 58 32	110 34 24	,,
,,	12 16 26.7	5 46 01.3	56 14 45	39 04.8	19 32.4	R	10	30.20	+15	56 48 18	13 08 52	110 42 40.5	,,
,,	12 24 45.6	5 54 20.2	56 18 24.7	38 47.6	18 59.8	R	10	30.20	+15	56 52 18	13 17 20	110 44 57	,,
,,	12 59 04.3	6 28 38.9	56 32 32.7	37 25.3	16 46.6	R	10	30.2	+15	57 08 18.4	13 51 19	110 40 01.5	,,
,,	13 05 59.1	6 35 33.7	56 35 42.2	37 28	16 20.2	R	10	30.2	+15	57 11 50	13 58 47.5	110 48 27	,,
,,	13 13 17.7	6 42 52.3	56 38 48.7	36 47.8	15 52.4	R	10	30.2	+15	57 15 12.8	14 05 58	110 46 30	,,
,,	13 20 49.5	6 50 24.1	56 41 48.7	36 26	15 24.2	R	10	30.2	+15	57 18 38	14 13 13.5	110 42 21	,,
,,	13 28 36.1	6 58 10.7	56 45 08	36 03	14 55.2	R	10	30.2	+15	57 22 19	14 21 01.5	110 42 42	,,
,,	13 35 48.4	7 05 23	56 48 27.5	35 40.4	14 28.5	R	10	30.2	+15	57 25 53.2	14 28 37.5	110 48 37.4	,,
,,	13 58 32.5	7 28 07.1	56 58 05.1	34 26.8	13 07	R	10	30.2	+15	57 36 36.8	14 51 01.5	110 43 36	,,
,,	14 05 31.8	7 35 06.4	57 01 13.2	34 00.7	12 42.5	R	10	30.2	+15	57 39 56.3	14 58 03.5	110 44 16.5	,,
17	8 46 28.3	2 15 00.1	66 08 48.6	34 31	31 48.5	S	10	30.4	+24	66 23 10.6	9 39 18	110 49 30	,,
,,	8 52 13.4	2 21 45.2	66 11 18.6	34 43.8	31 34.5	S	10	30.4	+24	66 25 57.3	9 45 18	110 53 12	,,
,,	8 59 10.4	2 28 42.2	66 18 54.2	34 59.4	31 16.5	S	10	30.4	+24	66 28 53.4	9 51 37.5	110 43 50	,,
,,	9 07 04.7	2 36 36.5	66 17 22.6	35 17	30 55.5	S	10	30.4	+24	66 32 47.1	10 00 02	110 51 22.5	,,
,,	9 15 39.8	2 45 11.6	66 20 46	65 36	30 31.5	S	10	30.4	+24	66 36 35	10 08 15	110 45 51	,,
,,	9 22 36.9	2 52 08.7	66 23 39.4	35 49.2	30 11.5	S	10	30.4	+24	66 39 50.4	10 15 17	110 47 05	,,

	"	9 29 06.3	2 58 38.1	66 26 22.3	36 01.2	29 52	S	10	30.4	+24	66 42 54.8	10 21 52	110 48 29	"
	"	9 35 09.	3 04 40.8	66 28 44.5	36 13	29 33.5	S	10	30.4	+24	66 45 35.8	10 27 43	110 45 33	"
	18	7 42 46	1 12 15.9	76 49 19.6	24 58.4	34 03.3	R	10	30.2	+15	76 55 48	8 35 31	110 48 16.5	"
	"	7 42 47.5	1 12 14	76 49 27.6	24 58.4	34 03.3	B	10	30.22	+24	76 55 54.5	8 35 43.5	110 52 15	"
	"	7 49 13.5	1 18 40.5	76 52 08.6	25 20	33 54.1	B	9	30.22	+24	76 58 47	8 42 01	110 50 07	"
	"	7 49 24	1 18 53.9	76 52 03	25 20.3	33 53.8	R	10	30.2	+15	76 58 42	8 41 52.5	110 44 39	"
	"	8 13 10.3	1 42 40.2	77 02 04	26 40.5	33 13.5	R	10	30.2	+15	77 09 26	9 05 22.5	110 40 34.5	"
	"	8 13 11.8	1 42 38.8	77 02 14.2	26 40.5	33 13.5	B	10	30.22	+24	77 09 34.6	9 05 40.8	110 45 30	"
	"	8 19 07.4	1 48 37.3	77 04 47.1	26 59.5	33 02.2	R	10	20.2	+15	77 12 20	9 11 42.7	110 46 21	"
	"	8 19 08.9	1 48 35.8	77 04 49.7	26 59.5	33 02.2	B	10	30.22	+24	77 12 24	9 11 52	110 49 12	"
	"	8 26 12.3	1 55 42.2	77 07 56.7	27 22.1	32 47.5	R	10	30.2	+15	77 15 34.2	9 18 47.7	110 46 22.5	"
	"	8 33 48	2 03 17.9	77 10 49.6	27 46	32 30.9	R	10	30.2	+15	77 18 54	9 26 06	110 42 01.5	"
	"	8 41 01.3	2 10 28.2	77 13 52.1	28 7.8	32 14.8	B	10	30.22	+24	77 22 12	9 33 20	110 42 57	"
	"	8 48 03.9	2 17 26.8	77 17 09.4	28 29	31 58.1	B	10	30.22	+24	77 25 44.4	9 41 05.7	110 54 43.5	"
	"	8 55 48.9	2 25 18.8	77 20 01.9	28 49.3	31 38.4	R	10	30.2	+15	77 28 57.4	9 48 05.5	110 41 40.5	"
	"	9 03 30.6	2 33 00.5	77 23 19.3	29 12.7	31 18.2	R	10	30.2	+15	77 32 33.6	9 55 59	110 44 37.5	"
	"	9 11 59.4	2 41 26.2	77 27 03.6	29 36.1	30 54.9	B	9	30.22	+24	77 36 40	10 05 02.3	110 54 01.5	"
	"	9 18 30.4	2 47 57.2	77 30 00.5	29 53.3	30 36.4	B	10	30.22	+24	77 39 52.8	10 12 48	111 01 54	"
	"	11 19 07.5	4 48 34.1	78 18 03	38 22.7	23 41.7	P	10	30.38	+24	78 34 17	12 11 24.2	110 42 33	"
	"	11 19 07.9	4 48 34.4	78 18 09.8	33 22.7	23 41.7	S	10	30.38	+24	78 34 25.6	12 11 43.5	110 47 16.5	"
	"	11 19 10.6	4 48 37.1	78 18 12.9	33 23.2	23 41.5	B	10	30.38	+24	78 34 28.6	12 11 49.9	110 48 12	"
	"	11 27 11.5	4 56 38.1	78 21 21	33 28.2	23 10.5	P	10	30.38	+24	78 38 04	12 19 42	110 45 58.5	"
	"	11 27 11.5	4 56 38.1	78 21 10.1	33 28.2	23 10.5	S	10	30.38	+24	78 37 55.2	12 19 23.3	110 41 18	"
	"	11 27 14.9	4 56 41.4	78 21 29.8	33 28.8	23 10.2	B	10	30.38	+24	78 38 13.6	12 20 03.8	110 50 26	"
	"	11 36 18.6	5 05 45.2	78 25 07	33 32.5	22 35.5	P	10	30.38	+24	78 42 20.8	12 29 05	110 51 15	"
	"	11 36 18.6	5 05 45.2	78 24 55.7	33 33	22 35.5	S	10	30.38	+24	78 42 11.5	12 28 46	110 45 12	"
	"	11 36 18.6	5 05 45.1	78 24 54.6	33 33	22 35.5	B	10	30.38	+24	78 42 08.6	12 28 39.25	110 43 33	"
	"	11 44 27.4	5 13 53.9	78 28 14.4	33 36	22 04.7	B	11	30.38	+24	78 45 55.2	12 36 56.6	110 45 40	"
	"	11 44 45.1	5 14 11.7	78 28 13.5	33 36	22 03.6	S	10	30.38	+24	78 45 59	12 37 05	110 43 19.5	"
	"	11 45 04.4	5 14 30.9	78 28 33	33 35.7	22 02.4	P	10	30.38	+24	78 46 18	12 37 45.3	110 48 36	"
	"	11 53 11	5 22 37.5	78 31 46	33 37	21 30.5	P	10	30.38	+24	78 49 58	12 45 47.8	110 47 34.5	"
	"	11 53 11	5 22 37.5	78 31 22.4	33 37.5	21 30.5	B	10	30.38	+24	78 49 36	12 45 01.7	110 36 03	"

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued.*

1820	Time by 259	Apparent time	Observed distance of Limbs	Apparent Altitudes: Moon's centre	Apparent Altitudes: Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
	H M S	H M S	° ′ ″	° ′	° ′			IN	°	° ′ ″	H M S	° ′ ″ W	
May 18	11 53 11	5 22 37.5	78 31 34.8	33 37.5	21 30.5	S	10	30.38	+24	78 49 50.6	12 45 33.3	110 43 57	☽ From Sun West
,,	12 01 49.9	5 31 16.4	78 35 19	33 37.3	20 55.7	P	10	30.38	+24	78 54 01.8	12 54 42.2	110 51 27	,,
,,	12 01 49.9	5 31 16.4	78 34 43.8	33 37.8	20 55.7	B	10	30.38	+24	78 53 28.5	12 53 32	110 33 54	,,
,,	12 01 49.9	5 31 16.4	78 35 02.1	33 37.8	20 55.7	S	10	30.38	+24	78 53 48.3	12 54 15.3	110 44 44	,,
,,	12 10 22.8	5 39 49.3	78 38 27	33 36.4	20 22.2	P	10	30.38	+24	78 57 41	13 02 43	110 43 25.5	,,
,,	12 10 22.8	5 39 49.3	78 38 31.6	33 36.8	20 22.2	B	10	30.38	+24	78 57 47	13 02 59.2	110 47 29	,,
,,	12 10 22.8	5 39 49.3	78 38 19.1	33 36.8	20 22.2	S	10	30.38	+24	78 57 36.4	13 02 35.5	110 41 33	,,
,,	12 18 01.8	5 47 28.3	78 41 27.3	33 35.1	19 52	B	10	30.38	+24	79 01 09.2	13 10 23	110 43 40	,,
,,	12 24 45.7	5 54 12.2	78 43 53.6	33 32.6	19 25.5	B	10	30.38	+24	79 04 00.8	13 16 40	110 36 37	,,
19	7 28 06.6	0 57 30.1	87 40 14.5	16 59.7	34 34.7	S	10	30.27	+24	87 43 06.2	8 20 09	110 39 43	,,
,,	7 28 07.6	0 57 32.6	87 40 34	16 59.7	34 34.7	P	10	30.27	+24	87 43 22.2	8 20 42.6	110 47 30	,,
,,	7 28 07.6	0 57 34.6	87 40 20.2	16 59.7	34 34.7	B	10	30.27	+24	87 43 08.4	8 20 14	110 40 13	,,
,,	7 35 54.8	1 05 19.8	87 44 05.4	17 27.8	34 25.6	P	10	30.27	+24	87 46 51	8 18 23.7	111 45 58.5	,,
,,	7 35 55.7	1 05 21.9	87 43 54	17 27.8	34 25.6	B	10	30.27	+24	87 46 48	8 24 30.1	110 44 27	,,
,,	7 36 22.5	1 05 46	87 43 59.6	17 29	34 25	S	10	30.27	+24	87 46 57.5	8 28 42	110 44 0	,,
,,	7 44 13	1 13 36.5	87 47 38.8	17 57.5	34 14.8	S	10	30.27	+24	87 50 43	8 37 00	110 50 52	,,
,,	7 44 13.6	1 13 38.6	87 47 48	17 57.5	34 14.8	P	10	30.27	+24	87 50 46.8	8 37 04.2	110 51 24	,,
,,	7 44 50.8	1 14 17.7	87 47 56.7	17 59.8	34 14	B	10	30.27	+24	87 50 56.4	8 37 27.5	110 47 48	,,
,,	7 52 39.3	1 22 04.3	87 51 18	17 27.5	34 02.3	P	10	30.27	+24	87 54 25.6	8 45 09	110 46 10.5	,,
,,	7 52 39.3	1 22 06.2	87 51 05.5	18 27.5	34 02.3	B	10	30.27	+24	87 54 13.6	8 44 43	110 39 33	,,
,,	7 53 09	1 22 32.5	87 51 21.6	18 29.5	34 01.3	S	10	30.27	+24	87 54 34.1	8 45 30	110 44 22.5	,,
,,	8 00 23.3	1 29 46.8	87 54 35.8	18 54.5	33 50	S	10	30.27	+24	87 57 56	8 52 56	110 47 18	,,
,,	8 00 23.6	1 29 48.6	87 54 39.4	18 54.5	33 50	P	10	30.27	+24	57 57 52	8 52 49.2	110 45 09	,,
,,	8 00 23.6	1 29 50.4	87 54 35.4	18 54.5	33 50	B	10	30.27	+24	87 57 49.5	8 52 42.5	110 43 08	,,
,,	8 07 06	1 36 29.5	87 57 45.1	18 18.6	33 39	S	10	30.27	+24	88 01 11	8 00 06.5	110 54 15	,,
,,	8 07 24.2	1 36 49.2	87 57 53	19 17.9	33 37.9	P	10	30.27	+24	88 01 14.2	8 59 44.2	110 43 45	,,
,,	8 07 24.2	1 36 51	87 57 50.4	19 17.9	33 37.9	B	10	30.27	+24	88 01 14.7	9 0 14.6	110 50 54	,,

„	8 15 16	1 44 41	88 01 07	19 45.1	33 23	P	10	30.27	+24	88 04 38.2	9 07 44.2	110 45 48	„
„	8 15 16.1	1 44 42.9	88 01 04.2	19 45.1	33 23	B	10	30.27	+24	88 04 37.2	9 07 42	110 44 46	„
„	8 15 16.1	1 44 39.7	88 01 03.4	19 45.1	33 23	S	10	30.27	+24	88 04 39.8	9 07 48	110 47 05.5	„
„	8 22 20.3	1 51 45.2	88 04 06	20 09.6	33 08.7	P	10	30.27	+24	88 07 47	9 14 41.2	110 41 30	„
„	8 22 20.3	1 51 43.8	88 04 06.7	20 09.6	33 08.7	B	10	30.27	+24	88 07 49.2	9 14 46.4	110 44 49	„
„	8 22 20.3	1 51 43.8	88 04 12.7	20 09.6	33 08.7	S	10	30.27	+24	88 07 58	9 15 06	110 50 33	„
„	8 32 52.8	2 02 17.7	88 08 52	20 45.5	32 46	P	10	30.27	+24	88 12 49	9 25 49	110 52 50	„
„	8 32 52.8	2 02 19.6	88 08 42	20 45.5	32 46	B	10	30.27	+24	88 12 39.7	9 25 27.8	110 47 03	„
„	8 32 53.2	2 02 16.5	88 08 32.2	20 45.5	32 46	S	10	30.27	+24	88 12 33.6	9 25 14.7	110 44 33	„
„	8 42 10	2 11 34.9	88 12 37	21 17.1	32 24.7	P	10	30.27	+24	88 16 47.8	9 34 35.6	110 45 10.5	„
„	8 42 10	2 11 36.8	88 12 38.4	21 17.1	32 24.7	B	10	30.27	+24	88 16 52.7	9 34 46.7	110 47 28	„
„	8 42 10.4	2 11 33.7	88 12 26.4	21 17.1	32 24.7	S	10	30.27	+24	88 16 41.7	9 34 22.5	110 42 12	„
„	11 18 14.5	4 47 44	*89 16 47.6	27 48.3	23 41	B	10	30.27	+24	89 27 53	12 11 40.6	110 59 54	„
„	11 34 19.7	5 03 44.1	*89 23 42	28 09.6	22 55.5	P	6	30.27	+24	89 35 24.4	12 28 18.2	111 08 32	„
„	11 34 25.8	5 03 48.8	*89 23 06.17	28 09.6	22 55.3	S	6	30.27	+24	89 34 54.67	12 27 13	110 51 03	„
„	11 48 21.3	5 17 45.7	*89 29 12	28 22.4	22 00.8	P	10	30.27	+24	89 41 41	12 42 10.3	111 06 09	„
„	11 48 21.3	5 17 47.8	*89 28 35	28 22.4	22 00.8	B	10	30.27	+24	89 41 04.5	12 40 51.4	110 45 54	„
„	11 50 50	5 20 13	89 29 30.4	28 24.3	21 50.8	S	12	30.27	+24	89 42 12.6	12 43 21.5	110 47 07.5	„
„	12 02 42.7	5 32 07.1	89 34 16	28 33	21 04.9	P	10	30.27	+24	89 47 32	12 55 05	110 44 43.5	„
„	12 05 11.1	5 34 37.6	*89 35 15.4	28 34.7	20 55.3	B	6	30.27	+24	89 48 40.7	12 57 38.4	110 45 12	„
„	12 05 13.1	5 34 36.1	*89 35 07.4	28 34.7	20 55.3	S	6	30.27	+24	89 48 37.2	12 57 31	110 43 45	„
„	12 06 45	5 36 09.3	89 35 59	28 35.7	20 49.2	P	10	30.27	+24	89 49 33	12 59 35.7	110 51 36	„
„	12 18 00	5 47 26.4	*89 40 21	28 41.4	20 05.2	B	8	30.27	+24	89 54 30.7	13 10 32	110 46 25	„
„	12 18 01.2	5 47 25.5	89 40 22	28 41.3	20 05.2	P	10	30.27	+24	89 54 32.8	13 10 36	110 47 37.5	„
„	12 18 10.6	5 47 33.6	89 40 24.5	28 41.5	20 04.6	S	10	30.27	+24	89 54 39.7	13 10 52	110 49 36	„
„	13 31 06.4	6 59 31.9	90 09 03.4	28 22.9	15 24.7	R	10	30.3	+16	90 27 30	14 23 30.5	110 44 39	„
„	13 38 23.4	7 07 48.9	90 11 48.8	28 15.6	14 58.2	R	10	30.3	+16	90 30 44.6	14 30 41.5	110 43 09	„
„	13 45 32.8	7 14 58.3	90 14 48	28 07.1	14 32.6	R	10	30.3	+16	90 34 08	14 38 09	110 47 40.5	„
„	13 52 37	7 22 03	90 17 45.7	27 58.5	14 07.3	R	10	30.3	+16	90 37 30	14 45 36.5	110 53 22.5	„
„	14 00 25.3	7 29 50.8	90 20 38.2	27 48.2	13 39.6	R	10	30.3	+16	90 40 36.7	14 52 30	110 39 48	„
„	14 06 45.8	7 36 11.3	90 23 14	27 39.1	13 17.8	R	10	30.3	+16	90 43 43.2	14 59 20.5	110 47 18	„
„	14 13 06.7	7 42 32.2	90 25 46.7	27 29.5	12 56.1	R	10	30.3	+16	90 46 38.6	15 05 48.8	110 49 09	„

* Distances observed with a reflecting circle.

LUNAR OBSERVATIONS AT WINTER HARBOUR, *continued*.

1820	Time by 250	Apparent time	Observed distance of Limbs	Apparent Altitudes. Moon's centre	Apparent Altitudes. Sun's centre, or Star	Observer	No. of Observations	Barometer	Thermometer	True distance	Apparent Greenwich time	Longitude	Phænomena
	h m s	h m s	° ′ ″	° ′	° ′			IN	°	° ′ ″	h m s	° ′ ″ W	
May 19	14 20 39.3	7 50 04.8	90 28 49	27 16.1	12 30.9	R	10	30.3	+16	90 50 05.2	15 13 27.2	110 50 36	D From him West
„	14 30 13.7	7 59 39.2	90 32 25.5	26 58.3	11 59.5	R	10	30.3	+16	90 54 15	15 22 37.3	110 44 31.5	„
„	14 36 44.7	8 06 10.2	90 35 13	26 45.9	11 38.1	R	10	30.3	+16	90 57 19.6	15 29 25.7	110 48 52.5	„
20	11 14 26.8	4 43 49.1	100 09 59	21 07.6	24 24.3	B	10	30.13	+22	100 16 36	12 06 18	110 37 13	„
„	11 14 27	4 43 48.8	100 10 84	21 07.6	24 24.3	P	10	30.13	+22	100 17 11.4	12 07 36.2	110 56 51	„
„	11 21 17.1	4 50 39.4	100 12 89.7	21 21.6	23 58.5	B	10	30.13	+22	100 19 37	12 12 58	110 34 39	„
„	11 21 33	4 50 54.8	100 13 32	21 22.2	23 57.4	P	11	30.13	+22	100 20 29	12 14 53	110 59 33	„
„	11 29 39.9	4 59 02.2	100 15 47.9	21 37.1	23 25.8	B	10	30.13	+22	100 23 08	12 20 44.4	110 25 45	„
„	11 29 40.1	4 59 01.9	100 16 36	21 37.1	23 25.8	P	10	30.13	+22	100 23 56.6	12 22 32	110 52 31.5	„
„	11 37 28.2	5 06 50.5	100 19 11.9	21 49.8	22 55.7	B	10	30.13	+22	100 26 55	12 29 06.2	110 33 55	„
„	11 37 28.4	5 06 50.2	100 19 46	21 49.8	22 55.7	P	10	30.13	+22	100 27 30.6	12 30 25	110 53 42	„
„	11 45 09.5	5 14 31.7	100 22 14.4	22 02.9	22 25.8	B	10	30.13	+22	100 30 21	12 36 41.6	110 32 28	„
„	11 45 09.7	5 14 31.5	100 22 53	22 02.9	22 25.8	P	10	30.13	+22	100 30 58	12 38 03.4	110 52 58.5	„
„	12 24 30.2	5 53 48.8	100 38 38	22 53	19 51.2	S	6	30.13	+22	100 48 54	13 17 43	110 58 33	„
21	11 55 43	5 24 57.5	111 23 02.4	15 33.3	21 56.3	S	10	29.99	+29	111 28 58	12 47 24.5	110 36 45	„
„	11 55 43.5	5 25 03.1	111 23 24	15 33.3	21 56.3	P	10	29.99	+29	111 29 17.8	12 48 08.9	110 46 27	„
„	11 55 43.5	5 25 02.1	111 22 46.2	15 33.2	21 56.3	B	10	29.99	+29	111 28 42	12 46 49.7	110 26 54	„
„	12 04 11.2	5 33 25.7	111 26 45.2	15 48.4	21 23.1	S	10	29.99	+29	111 33 03	12 56 22.5	110 44 12	„
„	12 04 11.7	5 33 31.3	111 26 51.6	15 48.4	21 23.1	P	10	29.99	+29	111 33 08.4	12 56 35.4	110 46 02	„
„	12 04 11.7	5 33 30.3	111 26 17.7	15 48.4	21 23.1	B	10	29.99	+29	111 32 36	12 55 23	110 28 10	„
„	12 12 15	5 41 29.5	111 30 00	16 02.8	20 51.6	S	10	29.99	+29	111 36 39	13 04 16	110 41 37.5	„
„	12 12 15.5	5 41 35.1	111 30 06	16 02.8	20 51.6	P	10	29.99	+29	111 36 44	13 04 28.5	110 43 21	„
„	12 12 15.5	5 41 34	111 29 36.9	16 02.8	20 51.6	B	10	29.99	+29	111 36 16	13 03 25.5	110 28 00	„
„	12 20 16.5	5 49 31	111 33 07.5	16 17	20 20.5	S	6	29.99	+29	111 40 09	13 11 56	110 36 45	„
„	12 20 17	5 49 36.6	111 33 35	16 17	20 20.5	P	6	29.99	+29	111 40 36	13 12 57.5	110 50 13.5	„
„	12 21 40.2	5 50 58.6	111 33 27.7	16 19.5	20 15	B	10	29.99	+29	111 40 29	13 12 40	110 25 21	„
June 4	29 38 21.9	22 05 64.2	64 27 15.2	14 59.6	35 43.1	R	10	29.55	+38	64 30 06.6	29 20 34.5	110 55 04.5	D From him East

	,,	28 47 16.1	22 14 48.4	64 22 53.5	14 39	36 01	R	10	29.55	+38	64 25 55	29 37 40.6	110 43 03	,,
	,,	29 01 24.2	22 28 56.4	64 15 51.5	14 03.5	36 28.4	R	10	29.55	+38	64 18 05.4	29 51 49	110 43 09	,,
	,,	29 07 58.5	22 35 30.7	64 12 34	13 42.8	36 39.8	R	10	29.55	+38	64 14 30.6	29 58 23.5	110 48 12	,,
	,,	29 15 47.5	22 43 19.6	64 08 36.5	13 25.2	36 52.5	R	10	29.55	+38	64 10 17	30 06 13	110 43 21	,,
	,,	29 23 00.6	22 50 32.7	64 04 47	13 05	37 04	R	10	29.55	+38	64 06 12	30 13 45.2	110 48 07.5	,,
	,,	29 30 23.9	22 57 55.9	64 01 08.5	12 44	37 12.2	R	10	29.55	+38	54 02 20	30 20 53.25	110 44 20.25	,,
	,,	29 38 37.7	23 06 09.7	63 56 48.5	12 19.9	37 21.7	R	10	29.55	+38	63 57 42.6	30 29 25.3	110 48 54	,,
	,,	29 45 13.5	23 12 45.4	63 53 25	11 59.5	37 27.4	R	10	29.55	+38	63 54 11.5	30 35 55	110 44 54	,,
	,,	29 53 43.8	23 21 15.7	63 49 23.5	11 33.5	37 35.3	R	10	29.55	+38	63 49 58	30 43 44	110 37 04.5	,,
	16	12 23 27	5 48 03.8	*70 46 40.7	24 42	23 19	S	6	29.86	+37	71 03 57	13 11 05	110 45 25	D From Sun West
	,,	12 35 36.2	6 00 12.4	*70 51 39.1	24 26.1	22 33.1	S	6	29.86	+37	71 09 30.3	13 23 22	110 47 27	,,
July	4	28 05 06.2	21 25 39	55 13 25	34 17.3	34 16.3	H	10	29.8	+47	55 29 24.2	28 49 05	110 51 30	D From Sun East
	,,	28 12 04.2	21 32 37	55 10 47.6	34 06	34 35.3	H	10	29.8	+47	55 26 02.3	28 55 52	110 48 45	,,
	,,	28 20 44.3	21 41 17	55 06 50.6	33 52	34 58	H	10	29.8	+47	55 21 36	29 04 28	110 47 45	,,
	,,	28 28 22	21 48 54.7	55 03 22	33 38.5	35 16.9	H	10	29.8	+47	55 17 42.1	29 12 01	110 46 34.5	,,
	,,	28 36 48.7	21 57 21.3	54 59 30.5	33 22.6	35 36.3	H	7	29.8	+47	55 13 23.5	29 20 22.5	110 45 18	,,

Being altogether 692 sets, containing 6,862 distances; whereof 384 sets were taken from the Observatory House on Melville Island, and 308 sets on board the Hecla. The house was 45″ west of the spot in which the Hecla was stationary during the winter, deduced from the bearing and measured distance; by allowing this difference to each of the 384 sets taken from the house, the mean of the 692 sets gives the longitude of the Hecla's station, 110° 48′ 28″.2 west of Greenwich.

ASIATIC SOCIETY MUMBAI

APPENDIX III.

OBSERVATIONS TO DETERMINE THE LATITUDE, AND THE LONGITUDE BY CHRONOMETERS.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

No III.

OBSERVATIONS DURING THE SEASON OF NAVIGATION IN 1819.

By these observations, the ships' track has been laid down, and the latitude and longitude of all lands determined, which are comprehended in the chart of the discoveries of the Hecla and Griper.

The initials, in the column denoting the observer, are those of Captain Parry, Lieutenant Beechey, Mr. Hooper, and of Captain Sabine.

The observed altitudes are corrected for index error only. The letters and signs which are annexed, signify as is usual, L and U altitudes of the lower or upper limb by the natural horizon; $\overline{\odot}$ $\underline{\odot}$ $\oplus$, altitudes of the upper and lower limbs, and of the centre, by an artificial horizon.

The latitude at other hours than at noon, except where it is expressly mentioned otherwise, is deduced by the ships' log, from the nearest observation, or from a mean of the two to which it is intermediate. The longitudes at noon are obtained in like manner.

The authority, on which the correction of the chronometer No. 228 to mean Greenwich time is founded, is shewn in the memorandum annexed to the Lunar Observations of June and August, 1819.

The longitude by 228 is the result of the elements contained in the table; the corresponding longitude by the mean of the six chronometers, selected for final determination, occupies the last column, and may be examined by means of the table which follows the Abstract of Observations in 1819.

LATITUDES, AND LONGITUDES BY CHRONOMETERS.

1819	Time by 228	228ª correction to mean Greenwich time	Observed altitude	Dip of horizon	Observer	Apparent time	Latitude	Longitude		REMARKS
								By 228	By six Chronometers	
	H M S	SLOW m s	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
May 18	. . . . .	. . . .	. . . . .	. . .	P	noon	56 47 25 N	. . . . .	. . . . .	
,,	4 11 09	2 33.4	30 45 31 L	3 44	H	4 13 35.3	57 08 30	1 00 20 W		
,,	4 11 19.1	2 33.4	30 24 00 L	3 37	P	4 13 44.8	57 08 40	1 00 30	1 01 55 W	
,,	4 13 51	2 33.4	30 03 49 L	3 33	B	4 16 17	57 08 00	1 00 21		
,,	18 51 17	2 34	23 12 48 L	3 37	B	18 52 02	58 21 12	1 25 30	1 27 12	
19	. . . . .	. . . .	50 31 20 L	4 00	S	noon	58 56 35			
,,	4 04 08.6	2 34	31 26 15 L	4 00	H	4 03 22.6	59 14 0	1 48 03		
,,	4 05 32	2 34	31 14 11 L	3 40	S	4 04 57.5	59 14 0	1 45 22.5	1 48 01.7	
,,	4 07 21	2 34	31 00 45 L	3 37	P	4 06 45	59 14 0	1 45 33		
,,	4 34 28	2 34	27 36 53 L	3 37	B	4 33 46	59 15 0	1 47 0	1 48 42	
,,	21 31 42	2 34.5	42 10 20 L	4 00	H	21 30 32.2	59 17 0	1 53 39	1 55 39.8	
20	. . . . .	. . . .	. . . . .	. . .	P	noon	59 17 01	. . . . .		
,,	20 16 20	2 35	33 07 35 L	4 00	B	20 08 30	59 28 0	3 35 15		
,,	20 24 01	2 35	34 02 15 L	4 00	P	20 15 56.2	59 24 30	3 36 48		
21	5 50 14	2 35.2	19 55 06 L	3 40	S	5 37 23.5	59 26 0	4 47 55	4 50 00.7	
,,	5 52 04.8	2 35.2	19 40 42 L	3 42	B	5 39 15	59 24 0	4 47 45		
,,	20 21 21.5	2 35.8	32 34 13 L	3 37	P	20 01 40	59 08 12	6 30 16	6 32 42.5	
,,	20 25 35.5	2 35.8	33 04 50 L	3 40	B	20 05 54	59 07 55	6 30 20		
,,	20 30 34	2 35.8	33 44 48 L	4 00	H	20 11 20	59 08 12	6 23 34	6 25 48.5	
,,	21 08 20.2	2 35.8	38 07 55 L	4 00	S	20 48 09	59 07 46	6 37 37	6 40 04.5	
22	. . . . .	. . . .	51 00 35 L	4 00	S	noon	59 05 16	6 57 0	6 59 24.5	
,,	4 43 58.5	2 36	29 50 18 L	3 40	P	4 20 45	59 02 0	7 22 59		
,,	4 46 20.5	2 36	29 32 47 L	3 37	B	4 23 03	59 02 0	7 23 52	7 26 10.5	
,,	4 53 29.3	2 36	28 39 14 L	4 00	S	4 30 10	59 01 46	7 24 27		
,,	20 05 29.7	2 36.4	29 12 23 L	4 00	P	19 32 02	58 41 53	9 41 07.5	9 43 45.5	
,,	20 19 35.1	2 36.4	20 38 42 L	4 11	B	19 44 09	58 40 19	9 46 32	9 48 10	
,,	21 35 49.8	2 36.4	20 08 11 L	4 00	S	21 02 40	58 39 45	9 51 28	9 54 06	

23	. . . . .	. . . .	. . .	P	noon	58 34 17	10 22 08.5	10 24 18.75				
"	5 11 32.5	2 36.6	28 26 18 L	3 50	S	4 33 44	58 26 58	11 00 50				
"	5 14 59.6	2 36.6	27 59 02 L	3 45	P	4 37 12.6	58 27 05	11 00 29	11 03 18			
"	5 36 43.5	2 36.6	25 13 04 L	3 37	B	4 58 29	58 26 49	11 07 16	11 09 54			
"	20 33 41	2 36.85	31 20 33 L	3 40	P	19 47 16.6	57 57 53	13 09 09				
"	20 36 44.6	2 36.85	31 45 32 L	4 0	H	19 50 26.6	57 58 00	13 07 30	13 10 08			
"	20 41 14.75	2 36.85	32 20 57 L	3 50	S	19 55 02	57 58 06	13 06 13				
"	20 43 43.5	2 36.85	32 39 12 L	3 40	B	19 57 32	57 58 00	13 05 55				
24	. . . . .	. . . .	52 37 00 L	3 50	S	noon	57 52 16	13 41 41	13 44 41	Rockall S 10° W 13 miles.		
"	5 07 38.5	2 36.9	30 52 17 L	3 40	P	4 17 02.9	57 46 05	14 11 30				
"	5 11 15.3	2 36.9	30 25 12 L	3 50	H	4 20 33	57 44 23	14 13 10	14 15 57			
"	5 12 24.5	2 36.9	30 15 57 L	3 50	S	4 21 41.6	57 46 16	14 13 24				
"	5 23 27.25	2 36.9	24 49 20 L	3 37	B	4 32 37	57 44 53	14 15 00				
"	20 55 47.6	2 37.5	32 50 28 L	4 0	P	19 56 08	57 16 22	16 26 45				
"	20 58 42.8	2 37.5	33 12 48 L	4 04	H	19 59 10.6	57 15 41	16 24 56	16 29 35			
"	20 59 56.25	2 37.5	33 22 35 L	4 0	B	20 00 22.6	57 16 30	16 26 35				
"	21 02 33	2 37.5	33 41 13 L	4 0	S	20 02 50	57 16 22	16 27 37				
25	. . . . .	. . . .	53 32 08 L	4 04	S	noon	57 08 37	17 05 25	17 08 32			
26	21 00 09.8	2 38.7	29 55 25 L	4 11	S	19 31 47.8	56 52 07	23 34 44				
"	21 02 31	2 38.7	30 14 47 L	4 11	B	19 34 10.5	56 51 50	23 34 20	23 40 08.3			
"	21 07 07.6	2 38.7	30 50 07 L	4 0	P	19 38 32.1	56 51 00	23 38 02				
"	21 24 02.3	2 38.7	33 05 50 L	4 0	H	19 55 22	56 51 30	23 39 15				
27	. . . . .	. . . .	. . . . .	. . .	P	noon	56 51 51	24 06 41	24 10 14.3			
"	21 15 35.75	2 39.2	31 12 02 L	3 35	P	19 40 50	57 20 00	25 09 06				
"	21 19 34	2 39.2	31 43 48 L	3 36	H	19 44 52	57 22 12	25 08 07	25 11 50			
"	21 21 02	2 39.2	31 56 09 L	3 35	S	19 46 23.75	57 21 49	25 07 15				
28	. . . . .	. . . .	53 45 30 L	3 37	S	noon	57 26 19	25 12 09	25 16 50.3			
"	21 37 07.9	2 39.8	33 46 54 L	4 0	B	19 59 39	57 32 04	25 48 11				
"	21 53 03	2 39.8	35 50 50 L	3 37	P	20 15 44	57 34 00	25 45 44	25 50 44			
29	. . . . .	. . . .	. . . . .	. . .	. .	noon	. . . . .	26 04 27.5	26 08 14			
30	21 17 09.3	2 41	28 52 06 L	4 05	P	19 18 19.1	58 14 00	30 22 48	30 26 58			
"	21 23 00.9	2 41	39 38 04 L	4 0	B	19 24 09	58 17 20	30 23 14	30 27 54			

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *continued.*

1819	Time by 228	228s correction to mean Greenwich time	Observed Altitude	Dip of Horizon	Observer	Apparent time	Latitude	Longitude		REMARKS
								By 228	By six Chronometers	
	H M S	SLOW m s	° ′ ″ L	′ ″		H M S	° ′ ″ N	° ′ ″ W	° ′ ″ W	
May 30	21 56 04.5	2 41	33 51 36 L	4 04	H	19 59 26.5	58 14 0 N	30 31 55 W	30 36 05 W	
31	. . . . .	. . . .	. . . . .	. . .	. .	noon	. . . . .	30 51 48	30 55 58	
June 1	23 23 23.4	2 42.1	43 14 29 L	4 00	P	21 10 12.6	57 05 00	34 35 59	34 40 44	
2	. . . . .	. . . .	. . . . .	. . .	P	noon	57 00 38	34 39 39	34 44 24	
,,	22 35 12.2	2 42.7	37 23 59 L	4 00	B	20 19 40	56 04 42	35 09 13	35 14 15	
,,	23 48 00.6	2 42.7	46 33 57 L	3 37	P	21 32 58.7	56 01 45	35 01 35	35 06 37	
3	. . . . .	. . . .	. . . . .	. . .	P	noon	55 57 51	35 02 41	35 07 43	
,,	23 33 07	2 43.3	45 03 05 L	4 00	S	21 14 57.3	55 05 30	35 46 20	35 51 22	
,,	23 37 02.2	2 43.3	45 29 20 L	4 00	H	21 18 24.9	55 04 21	35 53 10	35 58 12	
4	. . . . .	. . . .	. . . . .	. . .	P	noon	55 00 33	35 54 00	35 59 02	
,,	21 39 46.75	2 43.8	29 37 57 L	3 56	H	19 21 09.1	55 02 55	35 51 06	35 56 16	
,,	21 50 44.85	2 43.8	31 11 27 L	4 00	B	19 32 01	55 04 30	35 52 45	35 57 55	
,,	22 18 46.7	2 43.8	35 09 07 L	4 00	P	20 00 00	55 02 00	35 53 21	35 58 31	
,,	22 24 29	2 43.8	35 56 32 L	4 00	S	20 05 38	55 01 03	35 54 20	35 59 30	
,,	22 35 39.45	2 43.8	37 28 52 L	4 00	H	20 16 45.4	55 03 07	35 55 10	36 00 20	
5	. . . . .	. . . .	. . . . .	. . .	. .	noon	. . . . .	36 10 21	36 15 31	
6	. . . . .	. . . .	57 04 50 L	4 20	S	noon	55 21 22	37 23 09	37 28 24.3	
,,	7 13 36.6	2 44.4	28 17 14 L	4 10	S	4 49 05	55 31 04	37 14 00	37 19 15	
,,	7 24 18.25	2 44.4	26 46 57 L	4 0	B	4 59 42.5	55 32 57	37 17 17	37 22 32	
,,	22 05 43.5	2 45	32 39 50 L	3 50	S	19 41 57	55 49 07	37 03 30	37 08 50	
,,	22 18 37.8	2 45	34 23 34 L	3 36	H	19 54 25.7	55 48 16	37 09 51	37 15 11	
,,	22 19 21	2 45	34 42 00 L	3 40	B	19 55 17	55 46 13	37 07 45	37 13 05	
7	. . . . .	. . . .	. . . . .	. . .	P	noon	55 51 13	37 12 22	37 17 42	
8	. . . . .	. . . .	. . . . .	. . .	P	noon	55 26 57			
,,	22 33 07.8	2 46	36 14 14 L	4 00	H	20 07 11.9	55 06 53	37 30 20		
,,	22 44 57.2	2 46	37 50 56 L	3 33	B	20 19 09	55 07 14	37 28 33	37 34 59.7	
,,	23 25 51.8	2 46	43 09 54 L	3 30	P	20 59 58.6	55 03 00	37 29 39		

June 9	. . . . .	. . . .	56 48 30 L	4 00	S	noon	55 54 48	37 31 17	37 36 42.7		
„	6 53 07	2 46	31 44 23 L	3 55	S	4 26 00	55 45 00	37 47 15			
„	7 17 42.9	2 46	28 18 13 L	3 53	H	4 50 31.2	55 43 05	37 48 36	37 52 49.7		
„	7 26 53.4	2 46	26 59 47 L	3 49	P	4 59 47	55 42 00	37 46 06			
„	7 29 30.6	2 46	26 28 21 L	3 33	B	5 02 22	55 42 49	37 47 39			
„	21 57 24.5	2 46.7	31 06 22 L	3 50	P	19 29 03	55 46 00	38 04 29	38 08 31		
„	21 59 43.6	2 46.7	31 26 00 L	3 37	B	19 31 33	25 46 30	38 01 36			
„	22 17 02	2 46.7	33 49 27 L	3 47	S	19 48 40	55 46 33	38 04 25	38 09 00		
„	22 23 32.8	2 46.7	33 44 28 L	3 44	H	19 55 17.9	55 46 50	38 02 34			
10	. . . . .	. . . .	56 50 55 L	4 00	S	noon	55 57 25	37 56 31.5	38 02 03.75		
„	7 09 44.6	2 46.7	29 32 27 L	3 33	B	4 42 00.5	56 08 20	37 53 51			
„	7 12 27.1	2 46.7	29 10 01 L	3 57	H	4 44 45	56 08 20	37 53 22	37 59 09.25		
„	7 16 32.4	2 46.7	28 35 45 L	3 37	P	4 48 49.2	56 08 15	37 53 39			
11	. . . . .	. . . .	. . . . .	. . .	P	noon	56 29 50	40 00 00	40 05 38		
„	5 10 02.55	2 47.3	46 17 43 L	4 00	S	2 33 04.7	56 34 06	40 09 47	40 15 25		
„	6 40 27.1	2 47.3	34 53 08 L	3 40	P	4 03 05.3	56 37 30	40 15 33			
„	7 14 07.2	2 47.3	30 18 40 L	3 56	H	4 36 42.4	56 39 00	40 16 41	40 22 22		
„	7 14 43.5	2 47.3	30 14 12 L	3 33	B	4 37 12	56 38 45	40 17 57			
„	23 32 27.4	2 47.8	42 03 40 L	3 30	P	20 53 53.7	57 18 15	40 31 25	40 37 19		
„	23 37 02.4	2 47.8	42 37 00 L	4 11	B	20 58 28	57 19 32	40 31 50			
„	24 07 39.3	2 47.8	46 11 54 L	4 06	H	21 29 27.9	57 19 03	40 25 57	40 31 39		
12	. . . . .	. . . .	. . . . .	. . .	P	noon	57 23 09	40 28 20	40 34 02		
13	. . . . .	. . . .	. . . . .	. . .	P	noon	57 50 24	40 44 30	40 50 13.5		
„	6 39 42.6	2 48.4	35 10 49 L	3 50	B	3 59 38	57 55 00	40 50 20	40 57 03		
„	7 10 35	2 48.4	31 09 45 L	4 10	S	4 30 23	57 56 00	40 52 21			
„	21 39 57.6	2 49	26 58 14 L	4 12	B	18 57 46	57 42 50	41 20 30	41 26 08		
„	22 21 15.1	2 49	32 25 35 L	4 00	P	19 38 54.3	57 41 40	41 22 51	41 28 29		
„	22 32 28.9	2 49	33 55 21 L	4 08	H	19 50 06	57 42 13	41 23 10	41 28 48		
„	23 33 56	2 49	41 40 48 L	4 10	S	20 51 08.5	57 40 52	41 29 15	41 34 53		
14	. . . . .	. . . .	55 26 50 L	3 40	S	noon	57 37 16	41 41 50	41 47 28.5		
„	8 09 14.1	2 49	24 04 41 L	3 40	S	5 23 53.65	57 30 00	42 06 20	42 11 59.8		
„	8 11 06.95	2 49	23 49 57.6 L	4 00	B	5 25 46.5	57 30 00	42 06 20			

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *continued.*

1819.	Time by 228	223ª correction to mean Greenwich time	Observed Altitude.	Dip of horizon.	Observer.	Apparent time.	Latitude.	Longitude. By 228	Longitude. By six Chronometers	REMARKS.
	H M S	SLOW. m. s.	° ′ ″ L	′ ″		H M S	° ′ ″	° ′ ″ W	° ′ ″ W	
June 14	8 14 14.6	2 49	23 24 34 L	3 37	P	5 28 53.9	57 30 00 N	42 06 24	42 11 59.8	
„	23 56 44.4	2 49.6	44 02 45 L	4 00	P	21 09 32.4	57 24 02	42 32 18	42 37 49	
15	. . . . .	. . . .	. . . . .	. . .	. .	noon	57 25 44 DR	42 56 41	43 02 12.7	Land probably Cape Farewell, N. very distant.
16	. . . . .	. . . .	. . . . .	. . .	P	noon	58 12 43	47 41 10	47 46 42	
„	5 53 27	2 50.2	44 11 02 L	3 50	S	2 46 00	58 12 20	48 02 18	48 07 50	
„	7 54 50.5	2 50.2	29 24 18 L	3 44	H	4 44 25.7	58 12 25	48 16 25	48 21 07	
„	7 58 35.5	2 50.2	28 53 51 L	3 40	P	4 48 17.3	58 12 25	48 14 46		
„	8 00 57.7	2 50.2	28 36 48 L	3 44	H	4 50 28.1	58 12 25	48 17 37	48 23 09	
„	8 09 42.5	2 50.2	27 27 37 L	3 41	B	4 59 13	58 12 43	48 17 37		
„	23 18 56.25	2 50.7	36 12 39 L	3 39	B	20 08 02.5	58 18 16	48 21 47	48 27 20	
„	23 23 33.7	2 50.7	36 47 50 L	4 00	H	20 12 32.4	58 15 40	48 23 36	48 29 09	
„	23 27 36.5	2 50.7	37 18 21 L	3 40	S	20 16 44	58 18 30	48 21 27	48 27 00	
„	23 47 35.75	2 50.7	39 46 00 L	3 40	P	20 36 35.8	58 19 00	48 23 08	48 28 41	
17	. . . . .	. . . .	54 42 39 L	3 50	S	noon	58 29 29	48 19 40	48 25 13	
„	7 52 10	2 50.7	29 47 03 L	3 35	H	4 41 31.3	58 39 00	48 16 51	48 21 11	
„	8 27 49.6	2 50.7	25 08 49 L	4 00	B	5 17 20	58 41 45	48 14 32		
„	8 29 58.25	2 50.7	24 52 13 L	3 33	P	5 19 25	58 42 45	48 15 22		
18	. . . . .	. . . .	53 34 50 L	4 00	S	noon	59 39 05	. . . . .	. . . . .	Water much discoloured
„	24 47 20	2 51.9	91 24 12 O	. . .	P	21 37 24.3	59 49 00	48 00 50	48 08 40	On ice.
19	. . . . .	. . . .	. . . . .	. . .	P	noon	59 48 26	48 01 50	48 09 41.7	No land in sight. Weather very clear.
„	24 15 53.8	2 52.5	41 35 20 L	4 00	P	20 59 07.5	60 15 48	49 40 27	49 45 24.5	
„	24 16 07.5	2 52.5	41 37 32 L	4 00	B	20 59 26.2	60 15 34	49 39 12		
20	. . . . .	. . . .	52 58 30 L	3 40	S	noon	60 17 21	49 59 58.5	50 05 33.7	
„	25 09 18.4	2 53	44 47 37 L	3 40	P	21 36 16	61 11 00	53 41 05	53 47 47	
„	25 14 21.4	2 53	45 15 02.5 L	3 55	S	21 41 14.8	61 11 15	53 42 15		
„	25 40 03.4	2 53	47 23 04 L	4 00	B	22 06 35.5	61 10 20	53 47 30	53 53 37	
21	. . . . .	. . . .	52 00 08 L	3 40	S	noon	61 16 13	54 05 28	54 11 35	

„	7 18 06.4	2 53	35 39 16	L	3 38	P	3 41 13	61 24 00	54 38 14	54 45 21		
„	7 20 26.3	2 53	36 24 39	L	3 49	H	3 43 24.4	61 23 54	54 40 14			
„	24 17 13.1	2 53.6	37 31 18	L	4 00	P	20 28 29	61 59 45	57 33 33	57 40 06		
„	24 20 10.7	2 53.6	37 49 38	L	4 00	H	20 31 18	61 59 45	57 35 46			
„	24 21 48	2 53.6	37 58 57	L	4 00	P	20 32 45.5	61 59 45	57 38 12			
„	24 27 52.75	2 53.6	38 38 05	L	4 00	S	20 38 48	61 59 00	57 39 24			
22	. . . . .	. . . .	. . . . .		. . .	. .	noon	. . . . .	58 07 55	58 13 32.5		
„	23 27 25.4	2 54.2	30 10 09	L	4 00	B	19 24 24	62 45 13	61 04 59	61 10 35		
„	23 39 54.4	2 54.2	31 31 34	L	3 50	S	19 36 25.8	62 45 09	61 11 44	61 17 15		
„	23 40 31.1	2 54.2	31 35 57	L	4 00	P	19 37 03.3	62 45 20	61 11 33			
„	24 02 52.2	2 54.2	34 02 46	L	4 00	H	19 59 01.3	62 45 10	61 17 15	61 22 52		
„	27 11 00	2 54.2	49 29 48	L	3 30	S	23 05 59	62 43 21	61 34 21	61 38 42	Latitude computed by Mr. Cole's method.	
„	27 22 01	2 54.2	49 52 40	L	3 30	S	23 17 10		61 31 51			
23	. . . . .	. . . .	50 32 50	L	3 30	S	noon	62 43 12	61 32 49	61 38 25.7		
„	5 08 54	2 54.2	49 05 10	L	4 00	S	1 04 08.2	62 44 24.5	61 30 18	61 35 59	Latitude computed by Mr. Cole's method.	
„	5 19 52	2 54.2	49 05 10	U	4 00	S	1 15 05.6		61 30 27			
„	9 45 20.8	2 54.2	22 47 1	L	3 41	B	5 40 18	62 50 37	61 34 02	61 39 38		
„	10 54 06.2	2 54.2	15 13 12	L	3 37	H	6 49 07.2	62 49 30	61 32 47	61 38 24		
„	25 28 15	2 54.8	42 07 57	L	3 36	H	21 23 01.2	63 29 48	61 34 40	61 40 05		
„	25 37 48.9	2 54.8	42 56 07	L	3 35	P	21 32 28	63 29 48	61 36 22	61 43 07		
„	25 38 27.3	2 54.8	42 59 04	L	3 33	B	21 32 56	63 28 58	61 39 03			
„	27 10 15.7	2 54.8	48 42 30	L	3 50	S	23 15 0	63 35 26	. . . . .	. . . . .	Latitude computed by Mr. Cole's method.	
„	27 27 43.5	2 54.8	49 14 28	L	3 50	S						
24	. . . . .	. . . .	. . . . .		. . .	P	noon	63 34 24	61 34 28	61 39 53		
25	24 04 20.5	2 55.9	33 35 11	L	3 33	B	20 00 40.4	63 59 30	61 39 00	61 43 13		
„	26 50 09.5	2 55.9	94 31 28	Q	. . .	P	22 44 00.3	63 59 45	61 42 09	61 47 22		
„	26 55 12.8	2 55.9	94 59 38	Q	. . .	H	22 48 49.7	63 59 30	61 45 39	61 50 52		
26	. . . . .	. . . .	. . . . .		. . .	P	noon	63 59 29	61 42 54	61 48 07.3		
„	9 52 35.7	2 55.9	44 20 21	Q	. . .	P	5 46 11.4	63 58 00	61 45 02	61 50 15		
„	24 15 49.7	2 56.5	69 15 01	Q	. . .	P	20 08 40.8	63 49 00	61 54 25	61 59 07		
27	. . . . .	. . . .	. . . . .		. . .	P	noon	63 46 50	61 54 18	61 59 20		
„	10 14 31.3	2 56.5	39 38 17	Q	. . .	S	6 07 18	63 44 00	61 54 12	61 58 54		

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *continued.*

1819	Time by 228	223^s correction to mean Greenwich time	Observed Altitude.	Dip of horizon	Observer	Apparent time	Latitude	Longitude. By 228	Longitude. By six chronometers	REMARKS
	H M S	SLOW m s	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
June 27	23 38 13	2 57.1	30 32 57 L	3 33	P	19 30 03	63 40 00 N	62 06 52 W	62 10 30 W	
,,	24 55 44.5	2 57.1	38 39 57 L	4 00	P	20 47 43.3	63 40 00	62 04 27		
,,	26 27 43	2 57.1	46 12 17 L	4 20	S	22 22 31.2	63 40 11	62 02 14		
,,	26 35 35.8	2 57.1	46 40 54 L	4 20	S	22 27 44.26		62 01 50	62 06 47	Latitude computed by Mr. Cole's method.
,,	26 45 07.3	2 57.1	47 12 45 L	4 20	S	22 37 16	63 40 37	62 01 45		
28	. . . . .	. . . .	. . . . .	. . .	P	noon	63 39 04	62 01 56	62 06 47	
29	23 28 29	2 58.2	29 25 00 L	4 20	S	19 20 11.1	63 29 00	62 02 59	62 08 02	Land near the entrance of Cumberland Strait N. by W. 13 Leagues.
,,	26 52 50.7	2 58.2	47 44 21.3 L	7 26	S	22 45 00.47	63 27 45	61 55 22		
,,	27 07 17.8	2 58.2	48 23 30 L	7 26	S	22 59 33.8		61 54 03	61 58 51	Altitudes observed in the main top, height 27 feet. A good sea horizon, looking over ice. Latitude computed by Mr. Cole's method.
,,	27 24 04.3	2 58.2	48 59 05.3 L	7 26	S	23 16 28.6	63 28 25	61 51 59		
30	23 33 38.8	2 58.8	30 19 36 L	4 0	P	19 29 42	64 00 30	60 54 52		
,,	23 36 40.6	2 58.8	30 39 12 L	4 05	B	19 35 59.15	64 00 22	60 55 04	61 00 06.2	
,,	24 03 30.1	2 58.8	33 30 07 L	3 37	H	19 59 26.1	64 00 30	60 56 37.5	61 01 45.7	
,,	25 11 03	2 58.8	40 09 08 L	3 50	S	21 07 25	64 04 00	60 50 05	60 55 13.2	
July 1	. . . . .	. . . .	. . . . .	. . .	P	noon	64 11 54	60 27 10.5	60 32 18.7	
,,	8 59 47.3	2 58.8	27 00 53 L	4 05	P	5 00 19	64 29 52	59 46 36		
,,	9 01 42.8	2 58.8	23 49 08 L	4 05	B	5 02 08.5	64 29 52	59 48 05		
,,	9 19 25.3	2 58.8	24 53 33 L	4 03	S	5 20 04	64 31 44	59 44 50		
,,	24 08 39	2 59.4	34 32 15 L	4 00	B	20 14 01	65 10 00	58 32 20		
,,	24 11 27	2 59.4	34 49 41 L	4 12	H	20 16 55.8	65 09 20	58 30 36		
,,	24 17 17.2	2 59.4	35 21 58 L	3 35	P	20 22 27	65 09 20	58 35 21		
2	. . . . .	. . . .	. . . . .	. . .	P	noon	65 18 32	58 20 06	58 25 15	
4	24 29 53.4	3 01	36 02 47 L	3 37	P	20 40 34.7	66 50 00	57 04 36		
,,	24 36 28	3 01	36 35 20 L	3 37	B	20 47 00	66 50 28	57 06 54		
5	. . . . .	. . . .	. . . . .	. . .	. .	noon	66 56 38	56 48 35	56 53 22.5	
,,	24 34 40.55	3 01.45	35 46 30 L	4 0	H	20 43 26.7	67 42 0	57 30 55		
,,	24 40 15.75	3 01.45	36 12 11 L	4 0	P	20 48 46.7	67 42 15	57 34 41		

„	24 41 38.05	3 01.45	36 19 30 L	4 00	H	20 50 16.4	67 42 15	57 32 51			
„	25 10 26.75	3 01.45	38 29 04 L	4 00	B	21 18 30	67 41 46	57 41 36			
6	. . . . .	. . . .	. . . . .	. . .	P	noon	67 44 05	57 46 26	57 51 12.7		
„	8 32 21.3	3 01.7	28 22 08 L	3 33	B	4 39 28	67 49 04	57 55 0			
„	9 14 19	3 01.7	24 43 36 L	4 00	S	5 18 20	67 51 40	57 55 52			
„	24 35 48.6	3 02.3	35 35 22 L	4 00	P	20 46 26.2	68 20 30	57 00 43.5			
„	24 41 53.6	3 02.3	36 03 54 L	3 44	H	20 52 41.1	68 20 52	56 58 15			
„	24 51 17.6	3 02.3	36 45 49 L	4 00	B	21 01 40.5	68 20 41	57 04 22.5			
7	. . . . .	. . . .	. . . . .	. . .	P	noon	68 24 52	57 01 25.5	57 05 54.4		
„	8 7 54.6	3 02.4	30 04 16 L	3 56	S	4 18 07	68 29 18	57 06 15			
„	23 25 49.05	3 02.8	29 28 00 L	4 00	B	19 40 13.4	68 29 00	57 09 37			
„	23 32 00.75	3 02.8	30 01 25 L	4 00	H	19 41 56.4	68 28 07	57 09 03			
„	24 28 45.5	3 02.8	34 47 23 L	4 00	P	20 38 24.8	68 28 15	57 13 02			
„	24 45 03.6	3 02.8	36 03 46 L	3 56	S	20 54 52	68 28 42	57 10 45			
8	. . . . .	. . . .	. . . . .	. . .	P	noon	68 30 01	57 22 57	57 27 25.3		
9	. . . . .	. . . .	. . . . .	. . .	P	noon	68 45 53				
„	25 13 59.5	3 04	37 19 30 L	4 00	B	21 20 33.5	69 03 00	57 55 04			
„	25 17 02.9	3 04	37 31 30 L	3 45	P	21 23 44	69 03 30	57 53 15			
10	. . . . .	. . . .	. . . . .	. . .	P	noon	69 04 28	58 10 30			
12	. . . . .	. . . .	. . . . .	. . .	P	noon	69 42 44				
13	. . . . .	. . . .	. . . . .	. . .	. .	noon	. . . . .	57 33 55.5	57 37 40.9		
„	9 00 54.2	3 05.7	24 41 51 L	4 17	P	5 08 56	70 08 00	57 26 52.5			
„	9 13 26	3 05.7	23 38 10 L	4 17	H	5 21 28.1	70 08 00	57 26 47			
„	23 11 32	3 06.3	26 50 16 L	4 00	B	19 17 30	70 07 24	57 56 54			
„	24 43 10.5	3 06.3	33 55 57 L	4 31	P	20 48 20.7	70 10 30	58 08 45			
„	25 09 46.25	3 06.3	35 37 20 L	3 56	S	21 14 13.5	70 13 00	58 19 30			
14	. . . . .	. . . .	. . . . .	. . .	P	noon	70 17 43	58 24 00	58 27 23.3		
„	. . . . .	. . . .	41 30 07 ⊖	. . .	S	noon	70 17 32	. . . . .	. . . . .	By Kater's Altitude Instrument.	
„	24 42 46	3 06.9	33 19 44 L	4 00	P	20 44 10	70 26 0	59 03 43			
„	24 44 56.7	3 06.9	33 29 52 L	3 56	H	20 46 37.4	70 26 8	58 59 34			
15	. . . . .	. . . .	. . . . .	. . .	B	noon	70 27 42	59 11 58	59 14 57		
„	28 48 34.8	3 07.4	28 54 47 L	4 00	B	19 48 34	70 43 0	59 23 32			

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *continued.*

1819	Time by 228	223^{d} correction to mean Greenwich time	Observed Altitude.	Dip of horizon	Observer	Apparent time	Latitude	Longitude. By 228	Longitude. By six chronometers	REMARKS
	H M S	SLOW M S	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
July 15	23 51 23.4	3 07.4	29 07 11 L	4 00	P	19 51 14.2	70 43 0 N	59 25 37.5W		
,,	23 54 51	3 07.4	29 24 18 L	4 00	H	19 54 57	70 43 30	59 21 50		
,,	25 00 02.9	3 07.4	34 00 02 L	3 42	S	25 59 16.6	70 46 43	59 34 51		
16	. . . . .	. . . .	. . . . .	. . .	P	noon	70 56 15	59 30 37.5	59 33 18.4W	
17	. . . . .	. . . .	. . . . .	. . .	. .	noon	. . . . .	59 50 10	59 53 04.2	
,,	8 46 09	3 08	51 32 27 ☉	. . .	P	4 44 17.8	72 00 00	59 49 18		
,,	8 55 40	3 08	51 09 01.6 ☉	. . .	B	4 53 46	72 00 00	59 50 12		
,,	9 25 59	3 08	45 30 25 ☉	. . .	H	5 23 39.4	72 00 00	59 56 24	59 56 00	On ice.
,,	9 43 29	3 08	42 48 37 ☉	. . .	S	5 41 08	72 00 00	59 56 45		
18	24 40 57.8	3 09.2	31 19 28 L	3 37	P	20 40 48.2	72 31 30	59 22 06		
,,	25 07 54	3 09.2	32 57 23 L	3 40	B	21 08 03	72 31 28	59 17 27		
19	. . . . .	. . . .	. . . . .	. . .	P	noon	72 31 58	59 03 24	59 05 39.2	
20	22 59 04.1	3 10.3	24 02 36 L	4 00	P	19 01 50	72 55 43	58 36 34		
,,	23 23 45.7	3 10.3	25 49 52 L	3 50	B	19 26 48.5	72 55 26	58 32 30		
,,	23 51 58.7	3 10.3	27 46 14 L	4 00	H	19 54 44.4	72 56 15	58 35 20		
,,	24 17 59.4	3 10.3	29 29 54 L	4 4	S	20 20 54	72 56 49	58 34 20		
21	. . . . .	. . . .	. . . . .	. . .	P	noon	72 58 13	58 42 11	58 43 57.7	Saunderson's Hope, S 73 E distant. Remarkable hills N 89 30 E. N 84 30 E.
,,	22 46 31.6	3 10.9	22 30 46 L	3 54	H	18 43 29.5	72 13 45	60 02 52.5		
,,	25 00 16.7	3 10.9	31 21 16 L	4 5	P	20 57 00.8	73 13 00	60 06 15		
,,	25 03 54.6	3 10.9	31 31 49 L	4 11	B	21 00 08	73 13 09	60 13 57		
22	. . . . .	. . . .	. . . . .	. . .	P	noon	73 13 23	60 12 50	60 14 20.7	
,,	25 4 48	3 11.5	62 50 35 ☉	. . .	P	21 01 18.7	73 04 45	60 09 07.5		
,,	25 8 56.1	3 11.5	63 17 41 ☉	. . .	B	21 05 18	73 04 45	60 11 21	60 11 30.5	
,,	25 14 50.3	3 11.5	63 57 25 ☉	. . .	H	21 11 23.9	73 04 45	60 10 24		
23	. . . . .	. . . .	. . . . .	. . .	P	noon	73 4 10	60 10 17.5	60 11 30.4	
,,	8 37 33.3	3 11.7	50 28 15 ☉	. . .	B	4 33 57	73 3 15	60 10 48		
,,	8 46 54.2	3 11.7	49 09 26 ☉	. . .	H	4 43 12.7	73 3 15	60 12 03	60 12 38.5	

„	24 13 51	3 12.1	56 19 00 ☌	. . .	P	20 10 25.2	73 00 00	60 07 54		
„	24 23 05.8	3 12.1	57 30 17 ☌	. . .	B	20 19 38	73 00 00	60 08 24		
„	25 34 54.2	3 12.1	65 45 04 ☌	. . .	H	21 31 31.7	73 00 00	60 07 03		
24	. . . . .	. . . .	. . . . .	. . .	P	noon	72 59 30	60 07 47	60 08 40.8	
„	25 36 54.4	3 12.7	51 57 30 ☋	. . .	P	19 33 18.3	72 56 30	60 10 15		
„	25 40 23	3 13.7	52 25 54 ☋	. . .	B	19 36 43	72 56 30	60 11 13		
25	. . . . .	. . . .	74 14 20 ☋	. . .	S	noon	72 56 37	60 13 44	60 14 29.5	
„	23 35 13	3 13.2	50 11 45 ☌	. . .	P	19 31 30	73 01 30	60 11 52		
„	23 40 38.1	3 13.2	50 37 31 ☌	. . .	B	19 36 59	73 01 45	60 10 54		
26	. . . . .	. . . .	. . . . .	. . .	P	noon	73 02 17	60 11 23	60 11 57.7	
„	25 15 10.7	3 15.5	26 45 09 L	4 00	P	20 14 58.2	74 01 00	74 20 27		
„	25 22 41.7	3 15.5	27 11 50 L	3 55	H	20 22 25	74 01 00	74 21 28		
„	25 23 14	3 15.5	27 13 39 L	4 06	S	20 22 46	74 00 15	74 24 19		
„	25 27 46.5	3 15.5	27 29 45 L	4 11	B	20 27 37.3	74 00 48	74 19 37		
„	26 49 52	3 15.5	31 37 07 L	4 7	S	21 49 22	74 02 38	. . . . .	. . . . .	Latitude computed by Mr. Cole's method.
„	27 02 13.7	3 15.5	32 06 26 L	4 0	S	22 01 43.7		. . . . .	. . . . .	
30	. . . . .	. . . .	. . . . .	. . .	P	noon	74 01 57	75 00 31	74 59 58	
„	10 18 54.8	3 15.5	20 57 55 L	3 56	S	5 12 27	73 53 56	75 54 28		
„	10 41 10.6	3 15.5	19 24 24 L	3 40	P	5 34 52.9	73 53 0	75 51 58		
„	10 45 06	3 15.5	19 8 54 L	4 0	B	5 38 40.5	73 51 15	75 53 54		
„	10 48 59.4	3 15.5	18 54 03 L	3 50	H	5 42 14.1	73 54 25	75 58 52		
„	23 16 04.5	3 16.1	17 48 58 L	4 0	P	18 4 10.9	73 34 35	77 16 21		
„	23 23 46.1	3 16.1	18 22 10 L	4 0	B	18 12 00	73 34 30	77 14 30		
„	24 47 59.6	3 16.1	24 08 57 L	3 44	P	19 35 05 1	73 31 08	77 31 37		
„	24 50 07.8	3 16.1	24 18 05 L	3 40	H	19 37 21.6	73 31 08	77 29 33		
„	27 55 02	3 16.1	67 10 16 ☌	. . .	P	22 42 27.2	73 31 16	77 26 50		
31	. . . . .	. . . .	. . . . .	. . .	P	noon	73 31 16	77 23 03		
„	6 45 31.2	3 16.1	66 10 58 ☌	. . .	P	1 33 22.8	73 31 16	77 20 18	77 22 21	On shore at Possession Bay.
„	6 49 44.75	3 16.1	66 55 18 ☌	. . .	S	1 37 23.5	73 31 16	77 23 30		
„	6 56 37.5	3 16.1	66 29 38 ☋	. . .	S	1 44 24	73 31 16	77 21 33		
„	11 22 36.1	3 16.1	16 40 39 L	3 38	H	6 10 36.3	73 41 19	77 18 18		
„	24 47 51.1	3 16.5	23 48 55 L	4 0	P	19 35 50.4	74 01 00	77 19 0		

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *continued.*

1820.	Time by 228	228ª correction to mean Greenwich time.	Observed Altitude.	Dip of horizon.	Observer.	Apparent time.	Latitude.	Longitude. By 228	Longitude. By six Chronometers	REMARKS.
	H M S	SLOW. m. s.	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
July 31	24 50 21.2	3 16.5	23 58 44 L	4 00	B	19 38 19	74 00 30 N	77 13 22.5 W		
Aug. 1	. . . . .	. . . .	. . . . .	. . .	P	noon	73 55 18	77 41 04	77 40 00 W	
„	23 52 26.5	3 17.2	19 37 39 L	3 55	H	18 37 29.5	74 27 30	78 04 06		
„	24 45 40.1	3 17.2	23 06 33 L	4 00	P	19 30 45	74 27 58	78 03 39		
„	24 47 33.3	3 17.2	23 13 42.6 L	4 00	B	19 32 37.6	74 27 58	78 03 48	78 00 53.5	
„	24 38 12.8	3 17.2	22 38 22 L	4 00	S	19 23 27.5	74 27 09	78 01 12		
„	24 47 15.3	3 17.2	23 13 26 L	3 56	S	19 32 30	74 28 48	78 01 12		Latitude computed by Mr. Cole's method.
„	24 56 36	3 17.2	23 48 33 L	3 56	S	. . . . .				
2	. . . . .	. . . .	. . . . .	. . .	P	noon	74 30 03	78 02 28	78 01 02	Cape Osborne N. 79 Wt, 40 miles.
„	9 43 35.3	3 17.4	23 09 [illegible]	37	H	4 26 46.4	74 30 50	78 32 33		
„	9 47 44.9	3 17.4	22 53 22 L	3 40	P	4 30 56.3	74 30 50	78 32 27		
„	9 50 18.9	3 17.4	22 43 53 L	3 37	B	4 33 23.7	74 30 50	78 34 07.5	78 32 15	
„	9 38 11.66	3 17.4	23 30 11 L	3 40	S	4 21 15	74 30 55	78 34 28		
„	9 45 25.16	3 17.4	23 02 45 L	3 40	S	4 28 29	74 30 48.5	78 34 21		Latitude computed by Mr. Cole's method.
„	9 52 34.3	3 17.4	22 35 20 L	3 40	S	4 35 39		78 34 08		
„	24 40 32.9	3 17.8	22 03 17 L	4 00	P	19 17 49.5	74 21 45	80 01 54		
„	24 42 40.4	3 17.8	22 11 52 L	4 04	H	19 19 59.2	74 21 45	80 01 21	80 00 05	
„	24 44 40.9	3 17.8	22 18 54 L	4 00	B	19 21 48.5	74 21 45	80 04 07.5		
„	28 15 05.3	3 17.8	60 44 49 O	. . .	H	21 51 48.8	74 24 47.12	80 10 17	80 08 03.5	On ice. Hope's Monument N. 13° 14' W. Cape Osborn N. 25° 51' W.
„	27 18 17.8	3 17.8	60 59 47 O	. . .	S	21 55 01.5	74 24 47	80 10 15		
3	. . . . .	. . . .	33 01 50 L	3 37	S	noon	74 25 29	80 06 40	80 04 27.5	
„	9 35 38	3 18	23 59 07 L	3 40	S	4 10 52.7	74 18 17	80 32 50		
„	9 41 19.5	3 18	23 37 26 L	4 04	P	4 16 38	74 18 19	80 31 54	80 29 56	
„	9 43 48.1	3 18	23 27 54 L	4 00	H	4 19 07.4	74 18 19	80 31 42		
„	25 16 53.6	3 18.4	23 00 48 L	4 00	H	19 35 03.7	74 02 11	84 49 51	84 47 26	
„	25 22 10.1	3 18.4	23 19 54 L	3 40	S	19 40 04.8	74 02 43	84 53 40	84 51 15	No Land in sight from N. 47° 28' W. to S. 84° 30' W. Weather very clear.
4	. . . . .	. . . .	32 55 40 L	3 37	S	noon	74 15 42	86 88 00	86 30 35.1	

4	9 35 18	3 18.6	25 21 25 L	3 40	S	3 44 25.4	74 16 42	87 06 03	87 03 38		
6	. . . . .	. . . .	. . . . .	. . .	P	noon	73 52 20	89 29 24	89 27 00		
„	12 02 42.7	3 19.5	15 39 54 L	3 54	B	6 03 54.3	73 51 00	89 08 15	89 07 18.1	Thermometer 32°. Barometer 29.5.	
„	12 04 40.1	3 19.5	15 32 33 L	3 40	S	6 05 40.2	73 52 20	89 11 07.5			
„	25 26 19.3	3 20	21 41 29 L	3 37	P	19 22 26	72 54 16	90 25 33	90 21 44		
„	25 32 59.5	3 20	22 10 13 L	3 37	B	19 29 12.5	72 54 16	90 23 55			
„	26 14 12.2	3 20	25 04 30 L	3 38	H	20 12 02.4	72 53 00	89 59 42	89 56 42		
7	. . . . .	. . . .	. . . . .	. . .	P	noon	72 45 15	89 51 11.5	89 48 12		
„	10 00 33.95	3 20.2	48 27 55 ☌	. . .	S	3 59 24.4	72 45 15	89 45 15			
„	10 02 36.55	3 20.2	49 14 38 ☍	. . .	S	4 01 25.5	72 45 15	89 45 37.5			
„	10 28 30.9	3 20.2	44 33 40 ☌	. . .	B	4 27 35	72 45 15	89 41 52.5	89 41 21.6	On shore; East coast of Prince Regent's Inlet.	
„	10 32 24.5	3 20.2	44 02 11 ☌	. . .	H	4 31 17	72 45 15	89 44 40			
„	10 34 44.4	3 20.2	43 41 58 ☌	. . .	B	4 33 38.5	72 45 15	89 44 22.5			
„	25 55 46.9	3 20.7	23 48 15 L	3 40	P	19 52 19.8	72 05 37	90 20 57			
„	25 58 11	3 20.7	23 59 34 L	3 53	H	19 54 43.6	72 05 37	90 21 02	90 18 29.4	Cape Kater S. 20° 16' E. 18 miles.	
„	26 00 36.5	3 20.7	24 07 51 L	3 50	B	19 56 57	72 06 02	90 24 03			
8	. . . . .	. . . .	. . . . .	. . .	P	noon	72 13 37	90 06 34.7	90 03 00		
9	. . . . .	. . . .	. . . . .	. . .	P	noon	72 47 31	90 11 05	90 05 30		
10	11 23 12.3	3 21.8	17 30 11 L	3 33	P	5 22 46.7	73 03 00	89 40 42	89 34 55		
„	11 29 46.4	3 21.8	16 59 43 L	3 43	B	5 29 38	73 03 00	89 36 24			
12	. . . . .	. . . .	. . . . .	. . .	P	noon	72 59 40	90 08 45.9	90 04 00		
„	25 04 24.4	3 23.6	37 23 32 ☌	. . .	P	19 05 15.7	73 11 19	89 27 57			
„	25 36 43.5	3 23.6	41 53 27 ☌	. . .	B	19 37 43	73 11 19	89 25 54	89 22 22.7	On ice. Latitude computed by Mr. Cole's method.	
„	25 21 00.5	3 23.6	40 46 20 ☍	. . .	S	19 21 54.4	73 11 19	89 27 21			
„	25 28 27	3 23.6	40 45 02 ☌	. . .	S	19 29 20.8		89 27 22.5			
„	29 27 57.4	3 23.6	63 28 42 ☍	. . .	P	23 30 14.8	73 12 11	89 06 54	89 02 08.1	At the head of Port Bowen.	
13	. . . . .	. . . .	. . . . .	. . .	P	noon	73 12 11				
„	. . . . .	. . . .	. . . . .	. . .	B	noon	73 13 25	89 27 08.6	89 22 22.7		
„	25 13 05.8	3 24.2	19 02 12 L	3 40	P	19 15 04.2	73 37 00	89 13 52.5	89 08 51.3		
14	. . . . .	. . . .	. . . . .	. . .	P	noon	73 35 30	89 00 19	88 55 04		
15	. . . . .	. . . .	. . . . .	. . .	P	noon	73 39 36	88 41 34.4	88 36 20		
„	10 33 16.7	3 24.7	38 00 38 O	. . .	P	4 38 53.4	73 33 15	88 23 20	88 18 17		

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *continued.*

1819	Time by 22S	22S correction to mean Greenwich time	Observed Altitude	Dip of horizon	Observer	Apparent time	Latitude	Longitude By 22S	Longitude By six Chronometers	REMARKS
	H M S	SLOW m s	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
Aug. 15	10 35 47.5	3 24.7	38 43 40 ☉	. . .	P	4 41 22	73 33 15 N	88 23 52.5		
,,	10 38 42.5	3 24.7	37 16 08 ☉	. . .	H	4 44 18.9	73 33 15	88 23 24	88 18 17 W	On shore, east coast of Regent's Inlet.
,,	10 40 38.8	3 24.7	38 03 23 ☉	. . .	H	4 46 15.1	73 33 15	88 23 25		
16	. . . . .	. . . .	. . . . .	. . .	P	noon	73 45 10			
17	26 32 25.3	3 26.4	23 02 33 L	3 47	B	20 39 06.5	73 50 10	88 15 36	88 09 56	
18	. . . . .	. . . .	. . . . .	. . .	B	noon	73 50 56	88 14 39	88 09 00	
20	10 55 57.4	3 27.6	16 28 22 L	3 44	P	4 59 22.4	74 27 40	89 12 30	89 05 40	
,,	27 08 04.6	3 28.2	23 09 19 L	3 49	B	21 07 13.9	74 28 30	90 19 12	90 12 22	
21	. . . . .	. . . .	. . . . .	. . .	P	noon	74 29 15	90 25 50	90 19 00	
,,	27 52 19.7	3 28.8	24 37 32 L	4 10	P	21 49 27.8	74 32 26	90 53 22.5	90 49 12	
,,	27 58 23.5	3 28.8	24 50 27 L	4 18	B	21 55 09.5	74 32 26	90 58 55		
22	. . . . .	. . . .	. . . . .	. . .	P	noon	74 35 0	90 48 51.5	90 41 30	
,,	10 51 43.15	3 29	16 20 52.3 C	. . .	S	4 44 51.4	74 39 51	91 54 28		True altitudes, latitude by Mr. Cole's method.
,,	11 03 12.55	3 29	15 36 35.1 C	. . .	S	4 56 21.2		91 54 23	91 47 11.8	On shore at Cape Riley.
,,	10 57 55.5	3 29	32 00 21 ⊖	. . .	H	4 51 03.7	74 39 51	91 54 30		
,,	11 06 39.62	3 29	30 53 09 ⊖	. . .	H	4 59 46.3	74 39 51	91 54 52.5		
,,	24 49 47	3 29.3	13 21 50 L	3 37	P	18 34 01.5	74 28 20	94 10 09	94 02 36.5	Cape Hotham, N. 12° 36′ E.
23	. . . . .	. . . .	. . . . .	. . .	P	noon	74 20 52	94 51 10.5	94 43 15	
,,	11 39 49.6	3 29.3	13 30 13 L	3 36	H	5 21 42.4	74 25 28	94 47 16.5		
,,	25 46 52.1	3 29.9	15 54 45 L	3 46	B	19 17 45.5	74 23 15	97 34 30		
,,	25 48 55.2	3 29.9	16 02 23 L	4 00	P	19 19 41.5	74 23 15	97 36 21	97 27 27.5	
,,	26 24 51.6	3 29.9	18 17 08 L	4 04	H	19 55 42.5	74 24 0	97 35 19.5		
24	10 17 01.8	3 30	19 17 51 L	3 40	S	3 46 50	74 13 30	97 52 17		
,,	10 26 24.6	3 30	18 44 17.6 L	3 40	S	3 56 12.4		97 52 22.5	97 44 29	Latitude computed by Mr. Cole's method, barom. 29.6 therm. 30.5°
,,	10 34 40.4	3 30	18 14 07.6 L	3 40	S	4 04 27.4	74 13 14	97 52 35		
,,	26 15 30.1	3 30.5	17 06 41 L	3 41	B	19 42 45.8	74 31 00	98 33 15	98 26 59	
,,	26 18 30.5	3 30.5	17 16 50 L	3 45	S	19 45 30	74 31 00	98 37 14		

„	26 35 06.8	3 30.5	18 17 50 L	4 10	H	20 02 18.6	74 31 00	98 36 39	98 26 59			
25	. . . . .	. . . .	. . . . .	. . .	B	noon	74 40 30	98 39 05.5	98 30 30			
„	12 07 05.6	3 30.5	12 02 23 L	3 45	S	5 33 35	74 40 00	98 46 22.5				
„	12 10 41	3 30.5	11 47 53 L	4 00	H	5 37 19.1	74 40 00	98 44 12	98 34 36			
„	12 15 47.5	3 30.5	11 25 32 L	3 45	P	5 42 56.4	74 40 00	98 39 00				
„	24 49 59.5	3 30.8	11 08 31 L	3 50	B	18 15 24	74 46 19	99 04 48				
„	24 53 25.5	3 30.8	11 21 23 L	3 40	P	18 18 45.2	74 46 19	99 06 12	98 56 35			
„	25 01 17.7	3 30.8	11 52 25 L	3 40	S	18 26 42.8	74 46 33	99 04 41				
„	26 25 51.4	3 30.8	17 09 56 L	3 37	H	19 50 36.7	74 44 09	99 14 52.5	99 06 13.5			
26	. . . . .	. . . .	. . . . .	. . .	P	noon	74 48 47	99 10 24	99 01 15			
„	11 40 33.1	3 31	13 34 58 L	3 40	S	5 04 22.7	74 52 00	99 30 24	99 21 45.4			
„	12 04 34.3	3 31	12 02 28 L	3 42	P	5 28 13.8	74 50 45	99 33 11	99 24 38.1	East end of Bathurst Island. N 56 56 E.		
„	12 07 22.1	3 31	11 51 45 L	3 40	B	5 31 00.25	74 50 45	99 33 22.5				
„	25 02 30	3 31.5	11 11 11 L	3 50	B	18 21 20.7	74 55 10	100 47 36	100 39 41.6			
„	25 18 49.5	3 31.5	12 13 03 L	3 40	S	18 37 26.7	74 55 18	100 51 00				
„	26 50 36.9	3 31.5	17 44 13 L	3 57	H	20 08 01.3	74 58 15	101 09 28.5	100 59 52.1			
27	. . . . .	. . . .	24 59 55 L	3 40	S	noon	75 01 48	101 48 45	101 39 08.6			
„	12 32 23.3	3 31.7	10 37 17 L	3 40	P	5 44 49.1	75 02 58	102 28 24	102 20 0			
„	12 36 07.6	3 31.7	10 24 07 L	3 40	B	5 48 14.7	75 02 58	102 30 46				
„	14 59 30.5	3 31.7	1 57 58 L	3 38	S	8 10 08.2	75 00 00	102 53 21	102 43 44.6	Therm. 32°, bar. 30.03		
28	. . . . .	. . . .	48 54 50 Q	. . .	S	noon	75 09 23					
„	9 02 53.25	3 32.3	48 00 00 $\overline{Q}$	. . .	S	2 09 38.26	75 09 23	103 54 55	103 44 37	On shore on Byam Martin's Island.		
31	27 54 07.3	3 34.4	36 33 26 Q	. . .	H	20 53 20.8	75 02 40	106 05 19.5				
„	27 59 21.1	3 34.4	37 02 50 Q	. . .	S	20 58 27.8	75 02 40	106 07 02				
„	28 02 19.75	3 34.4	38 23 12 $\overline{Q}$	. . .	S	21 01 26.8	75 02 40	106 06 57	105 54 36	On ice. Point Griffiths on Melville Island, N 6° 32' E.		
„	28 08 19	3 34.4	37 52 29 Q	. . .	B	21 07 17.1	75 02 40	106 09 15				
„	28 11 00.4	3 34.4	39 11 02 $\overline{Q}$	. . .	B	21 10 02.7	75 02 40	106 08 12				
Sept. 1	. . . . .	. . . .	. . . . .	. . .	P	noon	74 59 35	106 19 41	106 07 37			
2	. . . . .	. . . .	. . . . .	. . .	P	noon	74 55 55	107 10 03.8	106 57 00			
„	9 07 00.4	3 35	41 16 38 Q	. . .	P	2 01 39.7	74 58 00	107 19 45				
„	9 10 17.6	3 35	42 06 40 $\overline{Q}$	. . .	P	2 04 48.8	74 58 00	107 21 54	107 03 06.7	On shore on Melville Island to the eastward of Point Ross.		
„	9 15 27.7	3 35	40 39 44 Q	. . .	H	2 10 13	74 58 00	107 18 16.5				

LATITUDES, AND LONGITUDES BY CHRONOMETERS.

1819	Time by 228	228ª correction to mean Greenwich time	Observed altitude	Dip of horizon	Observer	Apparent time	Latitude	Longitude		REMARKS
								By 228	By six Chronometers	
	H M S	SLOW m s	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
Sept. 2	9 20 47.4	3 35	41 17 40 ☉	. . .	H	2 15 47.6	74 58 00	107 14 34.5		
„	12 28 52	3 35	19 40 42 ☾	. . .	S	5 24 08.4	74 58 00	107 11 10	107 03 06.7	On shore on Melville Island, to the eastward of Point Ross.
„	12 29 32	3 35	20 38 38 ☉	. . .	S	5 24 47.5	74 58 00	107 11 24		Therm. 34°. Bar. 30°,29.
3	. . . . .	. . . .	. . . . .	. . .	P	noon	74 54 0	107 38 48	107 25 00	
„	13 13 15.6	3 35.5	6 48 16 L	4 00	P	6 06 51.3	74 55 20	107 41 15	107 27 59	
„	13 16 07.2	3 35.5	6 37 11 L	3 37	B	6 09 39.3	74 55 20	107 42 20		
„	25 24 54.2	3 36	8 01 43 L	3 50	B	18 15 03.3	74 54 30	108 35 31	108 19 50	
„	27 17 07.5	3 36	14 56 01 L	4 10	H	20 07 14.1	74 54 00	108 36 34		
4	. . . . .	. . . .	. . . . .	. . .	P	noon	74 54 49	108 46 16.5	108 31 44	
„	13 13 02	3 36	6 59 10 L	3 50	B	5 57 22.7	74 45 20	109 46 36	109 32 40	Therm. 33°. Bar. 30°,51.
„	13 15 27	3 36	6 50 25 L	4 05	S	6 00 46	74 45 20	109 48 20		
„	13 16 00.2	3 36	6 46 58 L	4 00	P	6 01 32.7	74 45 20	109 46 42		
5	29 23 09.7	3 37.3	39 15 03 ☌	. . .	S	22 05 04.8	74 46 56	110 50 10.5	110 33 59	On a low point to the eastward of Winter Harbour.
„	29 24 42.7	3 37.3	40 24 45 ☉	. . .	S	22 06 37.6	74 46 56	110 50 13.5		Therm. 27°. Bar. 30°,15.
6	. . . . .	. . . .	43 07 20 ☌	. . .	S	noon	74 46 56	. . . . .	. . . . .	
„	. . . . .	. . . .	. . . . .	. . .	..	noon	74 46 20	110 44 45	110 28 32	Anchorage of the Hecla in the Bay of the Hecla and Griper.

A TABLE

SHEWING

I. The Time by each of the six Chronometers of the Hecla selected for the final Determination of Longitude, at apparent noon, as ascertained by the Observations of each Day carried to Noon by the Ship's Reckoning.

II. The Daily Corrections to Mean Greenwich Time for Rate and Original Difference, agreeably to the Memorandum following the Lunar Observations for June and August, 1819.

III. The Longitude by each of the Chronometers separately, as thereby deduced.

IV. The Corrected or Received Longitude, being a Mean of the above Six Results.

V. A Comparison of the Longitude thus corrected with the Results of Lunar Observations.

1819		Parkinson and Frodsham, No. 228			Parkinson and Frodsham, No. 254			Parkinson and Frodsham, No. 259		
		Time	Correction	Longitude	Time	Correction	Longitude	Time	Correction	Longitude
		H M S	SLOW m s	° ′ ″	H M S	SLOW m s	° ′ ″	H M S	SLOW m s	° ′ ″
May	22	25 12	2 36	6 57 00 W	0 28 12.5	0 06.7	7 04 48 W	0 26 13	1 39.14	6 58 03 W
	23	38 52	2 36.6	10 22 08.5	0 41 53	0 08.9	10 30 29	0 39 49.75	1 43	10 23 11
	24	52 10	2 37	13 41 45	0 55 12.25	0 11.15	13 50 51	0 53 04.75	1 46.9	13 42 55
	25	1 05 44.2	2 37.5	17 05 25	1 08 46.5	0 13.5	17 14 59	1 06 35.95	1 50.8	17 06 41
	27	1 33 48	2 38.7	24 06 41	1 36 52.5	0 17.89	24 17 36	1 34 34.5	1 58.6	24 08 17
	28	1 38 09.4	2 39.2	25 12 09	1 41 14	0 20.1	25 23 32	1 38 52.9	2 02.5	25 13 51
	29	1 41 38.1	2 39.8	26 04 27.5	1 44 43	0 22.4	26 16 21	1 42 18.75	2 06.35	26 06 16
	31	2 00 46.2	2 41	30 51 48	2 03 54	0 26.9	31 05 13	2 01 22	2 14	30 54 00
June	2	2 15 56.5	2 42.1	34 39 39	2 19 07	0 31.4	34 54 36	2 16 28	2 21.9	34 42 29
	3	2 17 28	2 42.7	35 02 41	2 20 39.5	0 33.6	35 18 17	2 17 58	2 25.8	35 05 57
	4	2 20 52.7	2 43.3	35 54 00	2 24 04.7	0 35.9	36 10 09	2 21 19.7	2 29.7	35 57 21
	5	2 21 57.6	2 43.8	36 10 21	2 25 10	0 38.1	36 27 02	2 22 22.1	2 33.6	36 13 55
	6	2 26 48	2 44.4	37 23 09	2 30 01	0 40.3	37 40 20	2 27 10	2 37.5	37 26 52
	7	2 26 04.4	2 45	37 12 22	2 29 17.5	0 42.6	37 30 02	2 26 23.25	2 41.39	37 16 10
	9	2 27 19.1	2 46	37 31 17	2 30 32	0 47.1	37 49 47	2 27 32.5	2 49.2	37 35 25
	10	2 28 59.4	2 46.7	37 56 31.5	2 32 11.25	0 49.3	38 15 08	2 29 11.15	2 53	38 01 02
	11	2 37 12.7	2 47.3	40 00 00	2 40 24.25	0 51.6	40 18 57	2 37 19.7	2 56.9	40 04 09
	12	2 39 05.4	2 47.9	40 28 20	2 42 13.4	0 53.8	40 46 48	2 39 09.9	3 00.8	40 32 41
	13	2 40 09.6	2 48.4	40 44 30	2 43 15.3	0 56	41 02 50	2 40 11.35	3 04.7	40 49 00
	14	2 43 58.3	2 49	41 41 50	2 47 00.3	0 58.3	41 59 39	2 43 56	3 08.6	41 46 09
	15	2 48 57.2	2 49.6	42 56 41	2 51 56	1 00.6	43 14 09	2 48 51.7	3 12.5	43 01 03
	16	3 07 54.5	2 50.2	47 41 10	3 10 49.5	1 02.8	47 58 05	3 07 46.25	3 16.4	47 45 40
	17	3 10 28	2 50.7	48 19 40	3 13 18	1 05.1	48 35 46	3 10 16.5	3 20.3	48 24 12
	19	3 09 26.4	2 51.9	48 01 50	3 12 08.9	1 09.5	48 19 36	3 09 09.9	3 28.1	48 09 30
	20	3 17 07.4	2 52.5	49 59 58.5	3 19 46.1	1 11.8	50 14 29	3 16 47.9	3 31.9	50 04 57
	21	3 33 28.9	2 53	54 05 28	3 36 13.9	1 14	54 21 59	3 33 07.1	3 35.8	54 10 44
	22	3 49 38.1	2 53.6	58 07 55	3 52 08	1 16.3	58 21 05	3 49 13.6	3 39.7	58 13 20
	23	4 03 17.1	2 54.2	61 32 49	4 05 43.1	1 18.5	61 45 24	4 02 49.6	3 43.6	61 38 18
	24	4 03 23	2 54.8	61 34 28	4 05 44	1 20.8	61 46 12	4 02 52.5	3 47.5	61 40 00
	26	4 03 55.7	2 55.9	61 42 54	4 06 08.4	1 25.3	61 53 25	4 03 18.7	3 55.3	61 48 30
	27	4 04 40.6	2 56.5	61 54 18	4 06 49.6	1 27.5	62 04 17	4 03 59.9	3 59.2	61 59 46
	28	4 05 10.6	2 57.1	62 01 56	4 07 15.9	1 29.8	62 11 25	4 04 25.6	4 03.1	62 07 10
	30	4 04 37	2 58.2	61 53 48	4 06 35.75	1 34.25	62 02 30	4 03 44.5	4 10.8	61 58 50
July	1	3 58 49.9	2 58.8	60 27 10.5	4 00 44.9	1 36.5	60 35 21	3 57 54.9	4 14.7	60 32 24
	2	3 50 21	2 59.4	58 20 06	3 52 14.5	1 38.7	58 28 18	3 49 21.75	4 18.6	58 25 5
	5	3 44 13.2	3 01	56 48 36	3 45 54.15	1 45.5	56 54 55	3 43 04.4	4 30.3	56 53 40
	6	3 48 04.2	3 01.5	57 46 26	3 49 41.95	1 47.73	57 52 25	3 46 52	4 34.19	57 51 33
	7	3 45 03.4	3 02.3	57 01 25.5	3 46 37.9	1 49.99	57 06 58	3 43 47.4	4 38.1	57 06 22
	8	3 46 29	3 02.8	57 22 57	3 47 59.75	1 52.25	57 28 00	3 45 08.25	4 41.95	57 27 33

Arnold, No. 369			Arnold, No. 404			Arnold, No. 25			Mean Longitude by Chronometers	Longitude by Lunar Observations
Time	Correction	Longitude	Time	Correction	Longitude	Time	Correction	Longitude		
H M S	FAST m s	° ′ ″	H M S	FAST m s	° ′ ″	H M S	FAST m s	° ′ ″	° ′ ″	° ′ ″
0 29 22.5	1 33.3	6 57 18	0 33 57.25	5 26.7	7 07 37	0 33 14.5	5 47.75	6 51 41	6 59 24.5	
0 43 02	1 31.8	10 22 33	0 47 43	5 28.7	10 33 35	0 47 04.5	5 56.9	10 16 44	10 24 46.75	
0 56 19.75	1 30.35	13 42 21	1 01 06	5 30.6	13 53 51	1 00 31.5	6 06	13 36 22	13 44 41	
1 09 53	1 28.9	17 06 02	1 14 45	5 32.6	17 18 06	1 14 15.3	6 15.3	17 00 00	17 08 32	
1 37 55	1 25.9	24 07 16	1 42 58.5	5 36.6	24 20 29	1 42 38.25	6 33.75	24 01 07	24 10 14.3	
1 42 15	1 24.5	25 12 37	1 47 24	5 38.6	25 26 21	1 47 09	6 42.9	25 06 32	25 15 50.3	
45 41.75	1 22.98	26 04 41	1 50 55.75	5 40.6	26 18 47	1 50 47.5	6 52	25 58 52	26 08 14	
2 04 46.5	1 20	30 51 37	2 10 13	5 44.5	31 07 07	2 10 14.75	7 10.55	30 46 03	30 55 58	
2 20 52.25	1 17.1	34 38 47	2 25 32.5	5 48.5	34 56 00	2 25 48.5	7 28.95	34 34 53	34 44 24	
2 21 20.75	1 15.6	35 01 18	2 27 09.75	5 50.5	35 19 49	2 27 31.25	7 38.15	34 58 17	35 07 43	
2 24 41.95	1 14.1	35 51 58	2 30 37.45	5 52.5	36 11 15	2 31 05.2	7 47.3	35 49 29	35 59 02	
2 25 44	1 12.7	36 07 50	2 31 46	5 54.5	36 27 52	2 32 21	7 56.5	36 06 07	36 15 31	36 19 22 By 35 distances Moon from ♃ Aquilæ East
2 30 31.25	1 11.2	37 20 00	2 36 40.75	5 56.4	37 41 05	2 37 21.75	8 05.76	37 19 00	37 28 24.3	
2 29 43.75	1 09.72	37 08 30	2 35 59.5	5 58.4	37 30 17	2 36 50.5	8 14.95	37 08 52	37 17 42	
2 30 53.25	1 06.8	37 26 36	2 37 19.5	6 02.4	37 49 17	2 38 25	8 33.35	37 27 54	37 36 42.7	
2 32 30.5	1 05.3	37 51 18	2 39 03.5	6 04.4	38 14 46	2 40 17	8 42.5	37 53 37	38 02 03.75	
2 40 40.25	1 03.8	39 54 06	2 47 20.5	6 06.4	40 18 32	2 48 44	8 51.75	39 58 04	40 05 38	
2 42 31.4	1 02.3	40 22 17	2 49 15.4	6 08.4	40 46 45	2 50 50.4	9 00.9	40 27 22	40 34 02	
2 43 32.6	1 00.9	40 37 55	2 50 21.3	6 10.4	41 02 44	2 52 07.6	9 10.1	40 44 22	40 50 13.5	
2 47 18.3	0 59.4	41 34 43	2 54 12.3	6 12.3	42 00 00	2 56 09.3	9 19.3	41 42 30	41 47 28.5	
2 52 13.4	0 57.9	42 48 52	2 59 13.7	6 14.3	43 14 51	3 01 19.2	9 28.5	42 57 40	43 02 12.7	
3 11 08.75	0 56.45	47 33 05	3 18 14.25	6 16.3	47 59 29	3 20 28.5	9 37.7	47 42 42	47 46 41.8	
3 13 42.75	0 54.95	48 11 57	3 20 49.75	6 18.3	48 37 52	3 23 14.25	9 46.9	48 21 50	48 25 13	
3 12 41.6	0 52	47 57 24	3 19 52.4	6 22.4	48 22 30	3 22 34.6	10 05.3	48 07 20	48 09 41.7	
3 20 22.9	0 50.5	49 53 06	3 27 33.6	6 24.3	50 17 20	3 30 28.6	10 14.5	50 03 32	50 05 33.7	
3 36 45.4	0 49.1	53 59 05	3 43 56.9	6 26.3	54 22 39	3 47 02	10 23.75	54 09 34	54 11 35	
3 52 54	0 47.6	58 01 36	4 00 08.75	6 28.24	58 25 07	4 03 21.75	10 32.95	58 12 12	58 13 32.5	
4 06 32.6	0 46.1	61 26 37	4 13 51.1	6 30.2	61 50 14	4 17 11.6	10 42.1	61 37 22	61 38 25.7	
4 06 38.75	0 44.7	61 28 30	4 13 55.5	6 32.2	61 50 50	4 17 28.5	10 57.3	61 39 18	61 39 53	
4 07 11.4	0 41.7	61 37 25	4 14 30.2	6 36.2	61 58 30	4 18 21.7	11 09.7	61 48 00	61 48 07.3	
4 07 56.6	0 40.3	61 49 05	4 15 14.3	6 38.2	62 09 02	4 19 18.3	11 18.9	61 59 51	61 59 22	
4 08 22.1	0 38.8	61 55 50	4 15 44.4	6 40.1	62 16 04	4 20 01.1	11 28.1	62 08 15	62 06 47	
4 07 53	0 35.8	61 49 18	4 15 14.75	6 44.14	62 07 39	4 19 50.75	11 46.55	62 01 03	61 58 51	
4 02 06.65	0 34.3	60 23 06	4 09 29.9	6 46.1	60 40 57	4 14 15.4	11 55.75	60 34 54	60 32 18.7	
3 53 37.25	0 32.87	58 16 06	4 01 04.25	6 48.11	58 34 02	4 05 56.5	12 04.95	58 27 53	58 25 15	
3 47 30.9	0 28.5	56 45 36	3 54 57.15	6 54.1	57 00 45	4 00 19.4	12 32.5	56 56 43	56 53 22.5	
3 51 21	0 26.97	57 43 30	3 58 49	6 56	57 58 15	4 04 22.2	12 41.75	57 55 07.5	57 51 12.7	
3 48 19.9	0 25.5	56 58 36	3 55 44.9	6 58	57 11 43	4 01 32.4	12 50.9	57 10 22	57 05 54.4	
3 49 44.75	0 24	57 20 12	3 57 14	7 00	57 33 30	4 03 10	13 00	57 32 30	57 27 25.3	

1819.	Parkinson and Frodsham, No. 228			Parkinson and Frodsham, No. 254			Parkinson and Frodsham, No. 259		
	Time	Correction	Longitude	Time	Correction	Longitude	Time	Correction	Longitude
	H M S	SLOW m s	° ′ ″	H M S	SLOW m s	° ′ ″	H M S	SLOW m s	° ′ ″
July 13	3 47 10	3 05.7	57 33 55.5w	3 48 23.25	2 03.45	57 36 40 w	3 45 29	5 01.4	57 37 36 w
14	3 50 29.7	3 06.3	58 24 00	3 51 39.7	2 05.7	58 26 21	3 48 44.45	5 05.38	58 27 28
15	3 53 41	3 06.9	59 11 58	3 54 46.5	2 07.9	59 13 36	3 51 50.5	5 09.2	59 14 55
16	3 54 55	3 07.5	59 30 37.5	3 55 56.5	2 10.2	59 31 40	3 52 58.35	5 13.1	59 32 50
17	3 56 12.7	3 08	59 50 10	3 57 09.95	2 12.45	59 50 36	3 54 13.7	5 16.9	59 52 39
19	3 53 04.4	3 09.2	59 03 24	3 53 55.4	2 16.9	59 03 05	3 50 57.15	5 24.76	59 05 28
21	3 51 38.4	3 10.3	58 42 11	3 52 22.15	2 21.4	58 40 53	3 49 23.4	5 32.5	58 43 58
22	3 57 40.4	3 10.9	60 12 50	3 58 20.9	2 23.7	60 11 09	3 55 20.4	5 36.4	60 14 12
23	3 57 29.6	3 11.5	60 10 17.5	3 58 06.85	2 25.9	60 08 12	3 55 05.1	5 40.3	60 11 21
24	3 57 19	3 12.1	60 07 47	3 57 52.5	2 28.2	60 05 10	3 54 49.5	5 44.2	60 08 25
25	3 57 42.2	3 12.7	60 13 44	3 58 13.2	2 30.4	60 10 54	3 55 08.7	5 48.1	60 14 12
26	3 57 32.4	3 13.2	60 11 23	3 58 00.4	2 32.6	60 08 15	3 54 54.4	5 52	60 11 36
30	4 56 46.6	3 15.5	75 00 31	4 57 01.85	2 41.64	74 55 52	4 53 51.1	6 07.5	74 59 40
31	5 6 16	3 16.1	77 23 03	5 06 28.5	2 43.9	77 18 06	5 03.15.75	6 11.45	77 21 45
August 1	5 07 02.5	3 16.5	77 41 04	5 07 37	2 46	77 35 49	5 04 22.8	6 15.3	77 39 31
2	5 08 52.5	3 17.3	78 02 28	5 08 58.5	2 48.4	77 56 44	5 05 44.5	6 19.2	78 00 54
3	5 17 09	3 17.8	80 06 40	5 17 11.75	2 50.6	80 00 35	5 13 56	6 23	80 04 45
4	5 42 53.5	3 18.5	86 33 00	5 42 53.35	2 52.85	86 26 33	5 39 36.1	6 27	80 30 47
6	5 54 38.1	3 19.5	89 29 24	5 54 32.1	2 57.3	89 22 24	5 51 12.8	6 34.8	89 06 54
7	5 56 04.5	3 20.2	89 51 11.5	5 55 55.75	2 59.6	89 43 50	5 52 34	6 38.7	89 48 11
8	5 57 05.6	3 20.7	90 06 34.7	5 56 53.85	3 01.85	89 58 56	5 53 30.6	6 42.5	90 03 16
10. P M.	5 56 56.6	3 21.8	90 04 38	5 56 39.9	3 06.3	89 56 34	5 53 12.6	6 50.3	90 00 44
13	5 54 25	3 23.6	89 27 08.6	5 54 00	3 13	89 18 15	5 50 27	7 02	89 22 15
14	5 53 01.25	3 24.2	89 06 21.5	5 52 32.25	3 15.3	88 56 53	5 48 58.55	7 05.9	89 01 06.5
15	5 51 21.65	3 24.7	88 41 34.4	5 50 49.45	3 17.6	88 31 46	5 47 14.95	7 09.8	88 36 11
18	5 49 32.2	3 26.4	88 14 39	5 48 52.2	3 24.3	88 04 07	5 45 13	7 21.5	88 08 37
21	5 58 15.1	3 28.2	90 25 50	5 57 24.9	3 31	90 13 59	5 53 41.6	7 33.1	90 18 41
22	5 59 46.4	3 28.8	90 48 50.5	5 58 51.9	3 33.3	90 36 18	5 55 07.9	7 37	90 41 14
23	6 16 55.4	3 29.3	94 51 10.5	6 14 56.1	3 35.5	94 37 54.5	6 11 10.4	7 40.8	94 42 50
24	6 28 45.8	3 29.9	98 03 55.5	6 27 44.9	3 37.7	97 50 39.5	6 23 57.5	7 44.8	97 55 35
25	6 31 05.9	3 30.5	98 39 05.5	6 30 00.9	3 40	98 25 14	6 26 12.6	7 48.7	98 30 19.5
26	6 33 10.7	3 30.9	99 10 24	6 32 01.7	3 42.3	98 55 30	6 28 12.3	7 52.6	99 01 12
27	6 43 43.4	3 31.6	101 48 45	6 42 31.2	3 44.5	101 33 54	6 38 37.9	7 56.5	101 38 36
28	6 52 07.3	3 32.3	103 54 45	6 50 51.6	3 46.8	103 39 36	6 46 57.1	8 00.4	103 44 22.5
September 1	7 01 44.3	3 34.4	106 19 41	7 00 15.3	3 55.7	106 02 45	6 56 09.8	8 15.9	106 06 26
2	7 05 05.2	3 35	107 10 03.8	7 03 31.5	3 58	106 52 22.3	6 59 25.2	8 19.8	106 56 15.3
3	7 06 59.6	3 35.5	107 38 48	7 05 25.8	4 00.2	107 20 31	7 01 13.3	8 23.7	107 24 16
4	7 11 29.1	3 36	108 46 16.5	7 09 46.3	4 02.5	108 27 11	7 05 36.6	8 27.6	108 31 02
6	7 19 21.7	3 37.3	110 44 45	7 17 28.7	4 07	110 23 55	7 13 16	8 35.35	110 27 50

Arnold, No. 369			Arnold, No. 404			Arnold, No. 25			Mean Longitude by Chronometers	Longitude by Lunar Observations
Time	Correction	Longitude	Time	Correction	Longitude	Time	Correction	Longitude		
H M S	FAST m s	° ′ ″	H M S	FAST m s	° ′ ″	H M S	FAST m s	° ′ ″	° ′ ″	° ′ ″
3 50 22	0 16.6	57 31 21 W	3 57 56.5	7 09.9	57 41 39W	4 04 45.75	13 46.15	57 44 54W	57 37 40.9W	
3 53 41.2	0 15.2	58 21 30	4 01 15.95	7 11.95	58 31 0	4 08 11.45	13 55.45	58 34 00	58 27 23.2	
3 56 51.75	0 13.7	59 9 30	4 04 25.75	7 13.9	59 17 55	4 11 31.75	14 4.55	59 21 48	59 14 57	
3 58 05.25	0 12.23	59 28 15	4 05 40	7 15.9	59 36 02	4 12 55.5	14 13.75	59 40 26	59 33 18.4	
3 59 21.7	0 10.7	59 47 45	4 06 57.45	7 17.9	59 57 23	4 14 22.45	14 22.95	59 59 52	59 53 04.2	
3 56 12.4	0 07.8	59 01 09	4 03 50.65	7 21.87	59 07 11	4 11 35.9	14 41.35	59 13 38	59 05 39.2	
3 54 46.4	0 04.86	58 40 23	4 02 23.65	7 25.85	58 44 27	4 10 27.4	14 59.75	58 51 54	58 43 57.7	60 14 59.6
4 00 48.15	0 03.39	60 11 18	4 08 24.9	7 27.8	60 14 17	4 16 38.15	15 8.95	60 22 18	60 14 20.7	By 1209 distances Sun and Moon;— 640 Sun West, 569 Sun East.
4 00 37.35	0 01.9	60 08 51	4 08 12.6	7 29.8	60 10 41	4 16 36.85	15 18.15	60 19 40	60 11 30.4	
4 00 25.5	0 00.5	60 06 15	4 08 02.75	7 31.75	60 07 45	4 16 34.25	15 27.35	60 16 43	60 08 40.8	
4 00 48.7	SLOW 0 01	60 12 25	4 08 26.4	7 33.8	60 13 09	4 17 06.7	15 36.5	60 22 33	60 14 29.5	
4 00 37.4	0 02.5	60 09 58	4 08 17.15	7 35.8	60 10 20	4 17 06.65	15 45.75	60 20 14	60 11 57.7	
00 00.75	0 08.4	75 11 12	5 07 27.85	7 43.7	74 56 03	5 16 53.1	16 22.5	75 07 30	74 59 58	
03 22.5	0 09.9	77 23 03	5 17 00	7 45.7	77 18 35	5 26 29.5	16 31.75	77 29 27	77 22 21	
10 35.3	0 11.35	77 41 39	5 18 10.8	7 47.7	77 35 46	5 27 45.5	16 40.95	77 47 10	77 40 00	
5 12 00.5	0 12.8	78 03 20	5 19 35.25	7 49.7	77 56 23	5 29 15.75	16 50.15	78 06 24	78 01 02	
5 20 18	0 14.3	80 08 05	5 27 51.5	7 51.7	79 59 57	5 37 26.25	16 59.35	80 06 43	80 04 27.5	
5 46 01.6	0 15.8	86 34 21	5 53 36.1	7 53.6	86 25 37.5	6 03 21.35	17 08.55	86 33 12	86 30 35.1	
5 57 48	0 18.72	89 36 46	6 05 21.5	7 57.6	89 20 59	6 15 29.5	17 26.95	89 30 39	89 27 00	
5 59 16	0 20.2	89 54 02	6 06 47.7	7 59.6	89 42 02	6 16 55.7	17 36.2	89 49 53	89 48 12	
6 00 17.1	0 21.7	90 09 42	6 07 48.85	8 01.6	89 56 49	6 17 59.6	17 45.35	90 03 34	90 03 09	
00 09.9	0 24.6	90 08 38	6 07 39.9	8 05.6	89 53 35	6 18 11.3	18 03.75	90 01 53	90 01 00	
57 37.75	0 29.04	89 31 42	6 05 07	8 11.5	89 13 52.5	6 15 59.5	18 31.3	89 21 03	89 22 22.7	
5 56 14.25	0 30.5	89 11 11	6 03 42.25	8 13.3	88 52 11	6 14 41.75	18 40.5	89 00 19	89 00 20	
5 54 35.35	0 31.98	88 46 50	6 02 02.15	8 15.5	88 26 40	6 13 10.65	18 49.75	88 34 59	88 30 20	
5 52 48.9	0 36.4	88 21 20	6 00 13.7	8 21.5	87 58 03	6 11 45.9	19 17.3	88 07 09	88 09 00	
6 01 35.6	0 40.8	90 34 07	6 08 48.8	8 27.4	90 05 20	6 20 49.3	19 44.9	90 16 05	90 19 00	
6 03 07.4	0 42.3	90 57 25	6 10 17.15	8 29.4	90 26 56	6 22 27.1	19 54.1	90 38 15	90 41 30	
6 19 17.3	0 43.8	95 00 17	6 26 20.3	8 31.4	94 27 14	6 48 43.4	20 03.3	94 40 02	94 43 15	
6 32 06.8	0 45.3	98 13 02	6 39 13.3	8 33.4	97 39 59	6 51 43.6	20 12.5	97 52 47	97 56 00	
6 34 25.6	0 46.7	98 48 04.5	6 41 32.4	8 35.4	98 14 16.5	6 54 05.6	20 21.7	98 25 58	98 30 30	
6 36 32.4	0 48.2	99 20 09	6 43 36.9	8 37.3	98 44 53	6 56 12.4	20 30.95	98 55 22	99 01 15	
6 47 04.1	0 49.7	101 58 27	6 54 08.4	8 39.8	101 22 17	7 06 51.6	20 40.1	101 32 52.5	101 39 08.6	
6 55 28.3	0 51.2	104 04 52.5	7 02 29.3	8 41.3	103 27 00	7 15 17	20 49.3	103 36 55	103 44 37	
7 05 07.6	0 57.05	106 31 10	7 11 58.1	8 49.25	105 47 13	7 25 11.8	21 26.2	105 56 25	106 07 37	
08 28.2	0 58.5	107 21 40.3	7 15 17.4	8 51.24	106 36 33.3	7 28 35.7	21 35.35	106 45 05.3	106 57 00	
10 20.6	0 59.9	107 50 08.5	7 17 10.9	8 53.2	107 04 26	7 30 31.9	21 44.5	107 11 52	107 25 00	
7 14 50.1	1 01.5	108 57 54	7 21 38.3	8 55.2	108 10 46	7 35 02.8	21 53.75	108 17 14	108 31 44	110 31 45.7
7 22 40.2	1 04.4	110 56 09	7 29 25.2	8 59.2	110 06 30	7 43 00.4	22 12.1	110 12 05	110 28 32	by 6862 distances of the Sun & Stars from the Moon.

OBSERVATIONS made in the Winter of 1819, 1820, to ascertain the Error of the Chronometer No. 259, on Mean Time whence the Apparent Time; was obtained by which the Longitude of Winter Harbour was deduced from the Lunar Observations in Appendix II. Latitude 74° 47′ 18″ N.

1819	Time by 259	Observer	Observed Altitudes	Barometer	Thermometer	Mean Time	259 Fast of Mean Time	Phænomena and Remarks	
	H M S		° ′ ″	°	°	H M S	H M S		
Oct. 5	10 17 34.3	S	5 11 57	29.5	+2	3 05 10	7 12 24.3	Sun's L. L.	On board the Hecla.
12	9 35 24.5	B	4 25 47	29.5	−6	2 23 25.4	7 11 59.1	Ditto	
27	16 37 38	S	46 45 09.3	29.95	−20	9 26 28.65	7 11 09.35	Capella east of Mern.	
„	16 48 46.9	B	47 28 48	29.95	−20	9 33 33.3	7 11 13.6	Ditto	
„	17 02 17.3	S	38 08 56	29.95	−20	9 51 06.43	7 11 10.87	α Lyræ west of Mern.	
„	17 14 45.3	B	37 20 31.4	29.95	−20	10 03 34.35	7 11 12.32	Ditto	
30	11 43 25.4	S	23 26 19	29.75	−25	4 32 23.5	7 11 01.9	Arcturus west of Mern.	
„	11 52 02.6	B	22 52 48	29.75	−25	4 40 59.5	7 11 03.1	Ditto	
Nov. 28	14 48 04.75	S	38 33 32	29.71	−35	7 39 02.8	7 09 01.95	α Lyræ west of Mern.	
29	9 40 56.4	S	23 36 55.5	29.71	−36	2 31 47.5	7 09 08.9	Arcturus west of Mern.	
30	9 44 48.9	B	23 05 35	29.7	−35	2 35 50.9	7 08 58	Ditto	
Dec. 1	9 05 13.3	P	25 21 16	29.7	−36	1 56 27.36	7 08 45.94	Ditto	
27	7 57 26.5	S	21 11 38	29.7	−25	1 18 43.4	6 38 43	Ditto	
29	12 32 37.8	B	37 28 20	30.63	−41	5 53 52.27	6 38 45.53	α Lyræ west of Mern.	
„	12 34 47.8	B	37 19 55	30.63	−41	5 56 02.27	6 38 45.47	Ditto	
1820 April 16	28 18 39.5	P	22 45 48	30.1	−9	21 43 57.3	6 34 42.2	Sun's centre	At the Observatory House.
„	28 27 33	S	23 27 03	30.1	−9	21 52 39.1	6 34 53.9	Ditto	
18	9 12 32	S	22 34 20	30.31	−5	2 37 47.4	6 34 44.6	Ditto	
„	9 18 53.5	P	22 17 21	30.31	−5	2 44 03.5	6 34 50	Ditto	
„	9 26 07.6	B	21 57 10	30.31	−5	2 51 20.6	6 34 47	Ditto	
21	11 21 26.9	S	16 24 18	29.8	−5	4 46 38	6 34 48.9	Ditto	
„	11 25 39 7	P	15 52 20	29.8	−5	4 50 50.4	6 34 49.3	Ditto	
„	11 31 14.6	B	15 46 17	29.8	−5	4 56 24.3	6 34 50.3	Ditto	
May 6	11 56 39.5	S	18 25 41.65	29.25	+7	5 22 10.4	6 34 29.1	Ditto	
12	11 31 52.4	S	21 31 36.25	30.3	+15.5	4 57 29.3	6 34 23.1	Ditto	
16	11 47 22.6	S	21 25 58.3	30.31	+15.5	5 16 56.4	6 34 20.9	Ditto	
17	11 11 28.7	S	24 13 24	30.38	+22	4 39 08	6 34 21.7	Ditto	
27	12 34 39.8	S	20 25 42.1	30.05	+36	6 00 10.4	6 34 29.4	Ditto (true altitude)	
June 18	25 56 19.83	S	27 50.57	30.1	+36	19 21 10.68	6 35 05.15	Ditto	
19	11 35 39.4	S	26 34 51.5	30.1	+34	5 00 33.9	6 35 05.5	Ditto	

Of the altitudes in the preceding Table, those on the 5th and 12th of October were observed with a repeating circle, and all the others with a sextant and artificial horizon, being corrected for index error.

As it may be conceived that the circle would have been a preferable instrument for such purposes, during the time that the ships were stationary, it is necessary to explain the reason of its not having been employed.

In temperatures below Zero, two inconveniences were found to attend its use; first, the bubble of the level became enlarged by the contraction of the spirit beyond the extent of the ivory scale designed to register the distance of its ends from the Zero of the scale; thus when the level was nearly horizontal, both ends of the bubble were concealed by the brass frame work in which the level is enclosed; secondly, the several joints and pivots of the instrument gradually stiffened, and after a short exposure were effectually set fast.

As it was thought that the latter inconvenience might be in part occasioned by the thickening of the oil, the circle was taken to pieces so far as could be ventured, and thoroughly cleansed; but although certainly improved, it was not so much so as to become useful, since after six minutes' exposure to a cold of −20°, the instrument could scarcely be moved in azimuth by force applied to the pillar, and no other cause remained, as was believed, to which to attribute the obstruction, than the unequal contraction of the two metals, brass and steel, which are used in its construction.

It is probable that could this difficulty have been overcome, means might have been found of preventing the enlargement of the bubble of the level; which indeed was partly accomplished by the conveyance of heated air through a tin tube, filled beneath the level, (the terrestrial telescope being removed), having a chimney to carry the air clear of the instrument. This contrivance, though it embarrassed, yet did not impede the use of the circle, while it delayed the too great contraction of the spirit for above a quarter of an hour at a very low temperature; it might also have been improved, could any method have been devised of preserving freedom of motion in the joints and pivots.

So long as the apparent time could be deduced by the sun, it was just possible to obtain a *single* set of zenith distances before the inconvenience amounted to an absolute impediment; the temperature not being [illegible] −6°, and the circle having been thoroughly warmed by the cabin fire [illegible] exposure; but when the sun no longer rose to a sufficient height

horizon, and when altitudes, or zenith distances of the stars, were required for the purpose, the adjustments and management of the circle being necessarily performed by lamp-light, could not be got through with sufficient expedition, combined with the care requisite to ensure accuracy, before the completion of the observation was stopped by the causes above-mentioned.

As the employment of the repeating circle had been looked forward to for various purposes during the winter, and especially for observations on the amount of atmospherical refraction in extreme cold, its failure caused much disappointment; so long, however, as the temperature remained above the freezing point of mercury, the error of the chronometers on time could be obtained by altitudes with a sextant and artificial horizon with much facility and with tolerable accuracy; the mercurial horizon was used even so low as $-41°$, by previously warming the mercury and the leaden trough into which it was poured, and by completing the observation before they had time to cool.

ASIATIC SOCIETY

MERIDIAN ALTITUDES

TO DETERMINE THE LATITUDE OF THE HECLA'S STATION, AND OF THE OBSERVATORY AT WINTER HARBOUR.

The Results of these Altitudes have been re-computed since the return of the Expedition, using the Table of Atmospherical Refractions, published by Dr. Young, in the Nautical Almanack for 1823.

The Observatory bore S. 76° 50′ W. from the Hecla's station, distant 709.4 yards; the Difference of Latitude was consequently 5 seconds.

The Altitudes were observed with a Sextant and Artificial Horizon, unless when it is otherwise mentioned.

OBSERVATIONS MADE ON BOARD THE HECLA.

1819	Observed Altitude	Barometer.	Thermometer.	Observer	Latitude: Hecla's Station	Latitude: Observatory	REMARKS
	° ′ ″	IN.	°		° ″ ′	° ′ ″	
October 5	10 56 00 ☉	29.4	+ 4	B	74 47 22.5 N	74 47 17.5 N	Reflecting Circle & Level, an Index error allowed.
14	7 01 00 ☌	30.0	− 4	B	74 47 53.8	74 47 48.8	Reflecting Circle, direct.
20	4 53 03 ☌	29.9	−13	B	74 46 53.7	74 46 48.7	Ditto, inverted
29	53 50 53	29.7	−28	S	74 47 15.7	74 47 10.7	α Lyræ. Repeating Circle.
1820 March 7	9 58 39 ☌	29.18	− 2	P	74 46 51.1	74 46 46.1	
„	10 30 23.6 ☉	29.18	+ 2	B	74 47 01.9	74 46 56.9	
23	16 14 35 ☌	29.98	−22	P	74 47 00.5	74 46 55.5	
April 17	25 37 48 ☌	30.1	− 9	P	74 47 44.4	74 47 39.4	
18	25 59 17 ☌	30.3	− 5	P	74 47 08.4	74 47 03.4	
„	26 31 0 ☉	30.3	− 5	B	74 47 16.6	74 47 11.6	
21	27 00 53 ☌	28.78	− 1	P	74 47 04.2	74 46 59.2	
28	29 17 25 ☌	30.64	+11	P	74 47 05.5	74 47 00.5	
„	29 49 00 ☉	30.64	+11	B	74 47 16.5	74 47 11.5	
May 14	33 43 27 ☌	30.4	+14	P	74 47 20.5	74 47 15.5	
15	33 57 28 ☌	30.35	+18	P	74 47 39.2	74 47 34.2	
„	34 29 20 ☉	30.35	+19.5	B	74 47 26.1	74 47 21.1	
16	34 11 47.5 ☌	30.31	+18	P	74 47 10.5	74 47 05.5	
June 5	37 35 00.5 ☌	29.55	+38	B	74 47 14.8	74 47 09.8	
15	38 50 17 ☉	29.78	+37	P	74 47 41.6	74 47 36.6	
23	38 25 00 ☌	30.0	+45.5	P	74 47 17.4	74 47 12.4	
July 5	37 44 29 ☌	29.83	−43	P	74 47 18.9	74 47 13.9	
„	37 44 25 ☌	29.83	+43	B	74 47 22.9	74 47 17.9	
7	37 32 01 ☌	29.86	+56	P	74 47 23.4	74 47 18.4	
„	38 04 05 ☉	29.86	+50	B	74 46 48.1	74 46 43.1	Reflecting Circle, inverted.
8	37 24 39 ☌	29.87	+50	B	74 47 58.5	74 47 53.5	Ditto, direct.

OBSERVATIONS MADE ON BOARD THE HECLA, *continued.*

1819	Observed Altitude	Barometer	Thermometer	Observer	Latitude: Hecla's Station	Latitude: Observatory	REMARKS
	° ′ ″	IN.	°		° ″ ′	° ′ ″	
July 8	37 25 14 ☉	29.87	+50	P	74 47 23.5 N	74 47 18.5 N	
14	36 36 32 ☉	29.76	+55	P	74 47 22.7	74 47 17.7	
15	36 27 02 ☉	29.69	+45	P	74 47 27.4	74 47 22.4	
17	36 07 17.5 ☉	29.79	+57	P	74 47 13.5	74 47 08.5	
18	35 56 45 ☉	29.83	+46	P	74 47 17.1	74 47 12.1	
19	36 17 09 ☉	29.73	+50	P	74 47 32	74 47 27	
24	34 46 16 ☉	29.71	+49	P	74 47 24.6	74 47 19.6	
25	34 33 21.5 ☉	29.74	+43	P	74 47 26.1	74 47 21.1	

OBSERVATIONS MADE AT THE OBSERVATORY.

July 15	36 26 39.1 ☉	29.7	+50	B	74 47 55.3	74 47 50.3	Reflecting Circle, direct.
16	36 18 02.5 ☉	29.84	+54	B	74 46 43.5	74 46 38.5	Ditto, inverted.
18	35 57 34 ☉	29.92	+50	B	74 46 33.1	74 46 28.1	Ditto, inverted.
19	35 45 16 ☉	29.73	+50	B	74 47 59	74 47 54	Ditto, direct.
22	35 11 52 ☉	29.75	+52	B	74 46 42.1	74 46 37.1	Ditto, inverted.
24	34 45 46.6 ☉	29.75	+50	B	74 47 58.4	74 47 53.4	Ditto, direct.
Mean of Thirty-nine Meridian Altitudes					74 47 19.36	74 47 14.36	

ASIATIC SOCIETY MUMBAI

OBSERVATIONS

DURING AN

EXCURSION INTO THE INTERIOR OF MELVILLE ISLAND,

June, 1820.

The Longitude during this Excursion was determined by Arnold's pocket Chronometer No. 2109.

The difference of No. 2109 on Mean Time at Winter Harbour having been carefully noted at noon on the 1st and 16th of June, it was found to have lost $^{m}3\ ^{s}30$ in the interval, or 14 seconds daily.

Its daily rate for three weeks preceding the 1st of June, averaged 12.5 seconds; and from the 16th to the end of June, 12.7 seconds. The 14 seconds were therefore allowed as its daily loss during the Excursion; which, with its original difference on Mean Time at Winter Harbour on the 1st of June, slow $^{h}1\ ^{m}17\ ^{s}19.5$, increased by $^{h}7\ ^{m}23\ ^{s}14$, which is the difference of the Meridians of Greenwich and Winter Harbour, constituted No. 2109's daily correction to Mean Greenwich Time, as entered in the Table.

1820	Time by 2109	2109ª correction to mean Greenwich time	Observed Altitude	Observer	Apparent time	Latitude	Longitude	
	H M S	H M S SLOW	° ′ ″		H M S	° ′ ″	° ′ ″	° ′ ″
June 1	18 39 21.2	8 40 47.5	58 38 45 ☉	S	19 59 58	75 00 29 N	110 38 33 W	
2	. . . . .	. . . . .	74 01 20 ☌	P	noon	75 00 29		
„	16 53 11.25	8 41 01.5	45 01 51 ☉	S	18 14 13.7	75 00 29	110 33 24	
„	16 59 20	8 41 01.5	45 20 48 ☌	P	18 20 45.25	75 06 58	110 27 40.5	
3	. . . . .	. . . . .	74 03 12 ☌	S	noon	75 06 58		
4	19 12 50.3	8 41 29.5	62 47 45 ☉	P	20 31 15.5	75 22 43	111 14 26	
5	. . . . .	. . . . .	73 58 30 ☌	P	noon	75 22 43		
7	. . . . .	. . . . .	73 59 05 ☌	P	noon	75 34 47		
„	4 32 43.3	8 42 04.5	45 30 43 ☉	S	5 53 53	75 34 47	110 35 34	110 35 52
„	4 37 04	8 42 04.5	43 55 58 ☌	P	5 58 11.2	75 34 47	110 36 11	
„	18 11 48	8 42 11.5	56 09 09 ☉	S	19 31 44.7	75 33 54	110 53 56	110 51 54
„	18 15 39.3	8 42 11.5	55 35 40 ☌	P	19 35 51.25	75 33 54	110 49 52.5	
8	. . . . .	. . . . .	74 11 40 ☌	S	noon	75 33 54		
„	17 48 45	8 42 25.5	53 21 48 ☉	S	19 07 01	75 26 42	111 22 15	111 22 41
„	17 53 27	8 42 25.5	52 52 37 ☌	P	19 11 33.5	75 26 43	111 23 06.5	
9	. . . . .	. . . . .	74 36 10 ☌	P	noon	75 26 43		
10	. . . . .	. . . . .	74 57 0 ☌	S	noon	75 20 54		
11	. . . . .	. . . . .	75 21 40 ☌	P	noon	75 12 50		
„	7 39 24	8 43 00.5	25 46 42 ☉	P	8 55 47.1	75 12 50	111 51 09	111 50 05
„	7 43 39.7	8 43 00.5	25 25 35 ☌	S	8 59 54.3	75 12 50	111 49 00.5	
„	18 15 17	8 43 07.5	56 55 32 ☉	S	19 31 08	75 05 18	111 57 24	111 56 58
„	18 18 17	8 43 07.5	56 15 08 ☌	P	19 34 11.5	75 05 18	111 56 32	
12	. . . . .	. . . . .	76 39 30 ☉	P	noon	75 02 37		
„	18 37 17	8 43 21.5	58 51 47 ☌	S	19 54 31	75 02 37	111 37 04	111 37 10
„	18 40 58	8 43 21.5	60 21 00 ☉	P	19 58 10.8	75 02 37	111 37 17	
14	. . . . .	. . . . .	77 22 50 ☉	S	noon	74 53 56		
„	17 20 24.3	8 43 49.5	50 41 55 ☉	S	18 39 21	74 48 33	111 12 05	111 11 49
„	17 26 05.8	8 43 49.5	50 23 47 ☌	P	18 45 04.4	74 48 33	111 11 33.5	
15	. . . . .	. . . . .	76 35 45 ☌	P	noon	74 48 33		

OBSERVATIONS to ascertain the Error of No. 259 on Mean Time at the Observatory, previous to the Sailing of the Expedition from Winter Harbour in 1820.

1820	Time by 259	Observer	Observed Altitude	Barometer	Thermometer	Mean Time	259 Fast of Mean Time		Remarks
	H M S		° ′ ″	INCHES	°	H M S	H M S		
July 24	12 08 16.3	S	43 05 08 $\overline{\odot}$	29.78	50	5 32 29.22	6 35 47.08		
,,	12 16 55	S	41 56 48 $\overline{\odot}$	. . .	. .	5 41 07.9	6 35 47.1	H M S	The Altitudes were observed with a Sextant and mercurial horizon
,,	12 23 59.83	S	41 01 01 $\overline{\odot}$	. . .	. .	5 48 13.2	6 35 46.63	6 35 47.14	
,,	26 08 52	S	48 39 45 $\underline{\odot}$	29.58	48	19 33 04.27	6 35 47.73	At midnight of the 24th of July	
,,	26 16 40.3	S	49 38 29 $\underline{\odot}$	. . .	. .	19 40 53.3	6 35 47		
,,	26 24 36.3	S	50 37 18 $\underline{\odot}$	. . .	. .	19 48 49.2	6 35 47.28		

	H M S
The Sun's Transit at noon of the 24th, was at	6 35 44.3 by No. 259
And at noon of the 25th, at	6 35 45.64
July 24th, midnight....	6 35 44.97
At which time No. 259 was *actually* fast of Mean Time, as shewn by the preceeding Observations	6 35 47.14
Difference	2.17

Consequently this difference, or 2 seconds, omitting the decimal parts, being added to the time shewn by No. 259 at the Sun's Transit, gave the error of the Chronometer on Mean Time.

On the 31st of July, being the day preceding the sailing of the Expedition, No. 259 shewed H M S 6 35 54.32 at the Sun's noon Transit, and was therefore H M S 6 35 56.3 fast of mean Observatory Time at Winter Harbour, and H M S 0 45 13 slow of Greenwich Time.

ASIATIC SOCIETY MUMBAI

LATITUDES, AND LONGITUDES BY CHRONOMETERS, DURING THE SEASON OF NAVIGATION IN 1820.

The Authority on which the Correction of the Chronometer No. 259 to Mean Greenwich Time is founded, is shewn in the Account of the Going of the Chronometers, Appendix, pages x and xi.

The Longitude by No. 259 is the Result of the Elements contained in the Table; the corresponding Longitude by the Mean of the four Chronometers selected for final Determination occupies the last Column, and may be examined by means of the Table which follows the Abstract of Observations in 1820.

LATITUDES, AND LONGITUDES BY CHRONOMETERS.

1820	Time by 259	259s correction to mean Greenwich time	Observed Altitude	Dip of horizon	Observer	Apparent time	Latitude	Longitude		REMARKS
								By 259	By four Chronometers	
	H M S	SLOW m s	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
Aug. 2	10 38 52.9	47 20.5	50 08 06 ⊖	. . .	S	3 55 11	74 36 10	111 17 43.5		
,,	10 44 50	47 20.5	49 24 30 ⊖	. . .	B	4 01 12.2	74 36 10	111 16 37.5		
,,	27 22 22.4	47 19.5	53 08 26 ☉	. . .	P	20 38 46.6	74 36 06	111 16 43.5	111 16 39 W	On the Land Ice.
,,	27 24 52.1	47 19.5	54 27 40 ☌	. . .	P	20 41 15	74 36 06	111 17 03		
3	. . . . .	. . . .	. . . . .	. . .	. .	noon	74 36 06	111 17 02	111 16 39	
5	9 02 22.3	47 16.75	58 50 01 ☌	. . .	P	2 12 23	74 24 25	112 54 43.5		
,,	9 05 40.8	47 16.75	59 36 22 ☋	. . .	S	2 15 46	74 24 25	112 53 50	112 53 32	On Melville Island.
,,	27 25 56.3	47 15.5	52 08 36 ☋	. . .	S	20 32 46.7	74 25 35	113 43 27		
,,	27 29 59.4	47 15.5	51 32 35 ☌	. . .	P	20 36 48.3	74 25 35	113 43 48		
,,	27 33 25.4	47 15.5	51 55 02 ☌	. . .	B	20 40 13	74 25 42	113 44 09	113 43 01.3	On Melville Island. Banks's Land. W. extreme S. 75.05 W. } dist. by Est. 20 E. extreme S. 29.50 W. } leagues.
6	. . . . .	. . . .	. . . . .	. . .	. .	noon	74 25 42			
,,	26 15 52.1	47 14.25	42 04 14 ☌	. . .	B	19 22 45.5	74 25 42	113 44 0		
,,	27 22 45.9	47 14.25	50 12 36 ☌	. . .	P	20 29 43	74 25 38	113 43 07.5		
15	11 11 18.8	47 04.25	39 33 54 ☌	. . .	P	4 19 01.25	74 26 25	113 49 03		
,,	11 14 35.4	47 04.25	39 08 47.5 ☌	. . .	S	4 22 19	74 26 25	113 48 46.5		
,,	11 21 34.6	47 04.25	38 15 28.5 ☌	. . .	B	4 29 21.7	74 26 25	113 48 09	113 48 22.5	On Melville Island.
,,	27 44 12.2	47 03	47 21 53 ☌	. . .	B	20 52 06	74 26 25	113 48 0		
,,	27 54 53	47 03	48 27 15 ☌	. . .	II	21 02 48.8	74 26 25	113 47 29		
16	. . . . .	. . . .	. . . . .	. . .	. .	noon	74 26 25	113 48 17.5	113 48 22.5	
17	11 52 21.8	47 01.5	33 27 16 ☋	. . .	S	5 04 58.2	74 25 16	112 41 07.5		
,,	12 03 01.4	47 01.5	32 02 44 ☋	. . .	B	5 15 37.5	74 25 14	112 41 15	112 41 33.1	On Melville Island, two miles and a half to the westward of Cape Providence.
,,	12 09 36.75	47 01.5	31 09 37 ☋	. . .	P	5 22 14	74 25 16	112 40 48		
20	27 26 54.9	46 56.7	43 30 02 ⊖	. . .	P	20 40 07.8	74 25 16	112 43 15		
24	28 41 53.3	46 51.7	47 52 21 ⊖	. . .	P	21 58 19.6	74 27 19	112 09 41		
25	. . . . .	. . . .	. . . . .	. . .	. .	noon	74 27 19			
,,	11 25 23.2	46 51.5	30 47 41 ⊖	. . .	P	4 41 34	74 27 19	112 14 42	112 11 32	Cape Providence S. 56 W., dist. five miles and a quarter.
,,	11 42 55.75	46 51.5	29 02 32.5 ☋	. . .	B	4 59 22.25	74 27 15	112 10 47		

Aug. 27	11 02 04.1	46 49.25	13 51 52 L	4 00	P	4 50 05.1	75 01 30	104 25 00	104 24 16	N.W. point of Byam Martin Island ..... N. 35° 06′ W. S. point of Bitto ..... N. 78 25 E.
„	24 00 39.5	46 48	9 06 36 L	4 00	P	17 57 57.8	75 07 30	102 07 37.5	102 05 13	Shoal water half a mile to the westward.
„	24 28 34.2	46 48	10 52 56 L	4 11	B	18 26 06	75 08 30	102 04 16.5		
28	24 47 56.3	46 46.75	13 15 50 L	4 00	P	19 07 24.7	74 37 30	96 39 19.5	96 37 56	Browne Island,....E. end N. 8° 18′ E. Somerville Island, E. end N. 47 30 E.
29	. . . . .	. . . . .	. . . . .	. . .	. .	noon	74 27 05			
30	10 28 21.5	46 45.5	10 39 34 L	4 10	P	5 26 06.4	74 08 00	87 11 16.5	87 09 21	Cape Craufurd S 67° 25′ E.
„	11 08 54.2	46 45.5	7 48 38 L	4 11	B	6 08 02	74 02 20	86 50 40	86 48 44.5	
„	25 52 21.7	46 44.25	12 51 21 L	4 00	P	19 09 45.4	73 59 20	82 18 49.5	82 16 54	Cape Franklin, S. 54° 45′ W. Cape Hay, ... S. 79 18 E.
Sept. 2	6 49 36	46 41.75	21 24 40 L	4 00	P	2 42 38.2	72 08 30	73 34 16.5	73 32 02.5	
„	24 52 12	46 40.5	20 16 01 L	4 00	P	20 54 23.9	71 31 14	71 20 07.5	71 17 53.5	
3	. . . . .	. . . . .	25 52 53 L	1 49	S	noon	71 21 15	. . . . .	. . . . .	In a boat.
„	7 19 57	46 40.5	37 54 49 ⊖	. . .	S	3 22 16	71 15 34	71 19 37.5	71 17 23.6	On shore.
„	22 01 33.5	46 39.25	7 13 03 L	4 00	P	18 06 30	71 09 20	70 42 55.5	70 40 41.5	
4	22 15 47.8	46 38	8 23 34 L	4 00	P	18 25 20.6	70 48 10	69 38 31.5	69 36 17.5	
6	25 34 41.1	46 35.5	44 09 57 ☌	. . .	P	21 49 25.8	70 21 57	68 30 31.5	68 28 33	On Observation Island.
„	25 38 54.2	46 35.5	45 05 47 ⊖	. . .	S	21 53 39.2	70 21 57	68 30 24		
7	. . . . .	. . . . .	. . . . .	. . .	P	noon	70 21 57			
„	7 43 23.1	46 35.5	31 01 58 ⊖	. . .	S	3 57 41.7	70 22 45	68 38 21	68 37 06	On shore at the Esquimaux Huts, in the Inlet called the River Clyde.
„	7 47 14.5	46 35.5	30 27 39.7 ⊖	. . .	P	4 01 29.6	70 22 45	68 39 41.2		
8	. . . . .	. . . . .	. . . . .	. . .	. .	noon	70 13 35			
„	25 13 14.6	46 33	13 02 38 C	4 04	P	19 33 32.5	69 40 01	67 16 13.5	67 14 20.5	
9	. . . . .	. . . . .	. . . . .	. . .	. .	noon	69 24 37	67 07 36.5	67 05 43.6	
„	24 44 56.7	46 31.75	20 04 22 L	4 04	P	21 05 52.2	69 05 15	67 11 57	67 10 09	Cape Kater, N. 53° 30′ E.
10	. . . . .	. . . . .	. . . . .	. . .	. .	noon	. . . . .	66 58 27	66 56 39	
„	25 46 45.6	46 30.5	15 45 06 L	4 00	P	20 12 21.1	68 19 50	66 06 36	66 04 53	
11	. . . . .	. . . . .	. . . . .	. . .	. .	noon	68 19 45	66 07 28	66 05 45	
„	22 06 00.6	46 29.25	6 43 38 L	4 00	P	18 31 58.6	68 18 36	66 05 31.5	66 03 46.5	
12	. . . . .	. . . . .	. . . . .	. . .	P	noon	68 15 20	65 50 23.5	65 48 38.5	
„	. . . . .	. . . . .	25 49 24 C	. . .	S	noon	68 15 51	. . . . .	. . . . .	Kater's Altitude Instrument.
14	. . . . .	. . . . .	. . . . .	. . .	P	noon	68 22 59	65 14 19	65 13 04	
„	. . . . .	. . . . .	24 56 02.5 C	. . .	S	noon	68 23 16	. . . . .	. . . . .	Kater's Altitude Instrument.

LATITUDES, AND LONGITUDES BY CHRONOMETERS, *concluded.*

1820	Time by 259	259ª correction to mean Greenwich time	Observed Altitude	Dip of horizon	Observer	Apparent time	Latitude	Longitude		REMARKS
								By 259	By four Chronometers	
	H M S	SLOW m s	° ′ ″	′ ″		H M S	° ′ ″	° ′ ″	° ′ ″	
Sept. 14	6 23 36.75	46 26.75	18 18 30 L	4 00	S	2 55 15.1	68 30 11	64 52 05	64 50 29	
„	6 26 33.7	46 26.75	18 06 19 L	4 00	P	2 58 14.6	68 30 11	64 51 22.5		
17	6 29 19.2	46 23	16 57 50 U	4 04	P	3 05 02.8	68 39 00	64 05 42	64 04 15	
21	23 48 48.9	46 17	14 58 37 C	4 04	P	20 46 15	67 38 28	59 03 24	59 01 54	
22	. . . . .	. . . . .	. . . . .	. . .	. .	noon	67 37 34	58 58 54	58 57 23.5	
„	7 15 35.1	46 17	9 50 44 L	4 08	S	4 13 55	67 30 00	58 51 32	58 19 22	
„	7 18 47.1	46 17	9 33 27 L	4 00	P	4 17 12.5	67 30 00	58 50 12		
„	22 35 36.4	46 15.7	8 57 47 L	4 00	P	19 37 00.8	67 08 16	58 08 27	58 07 13	
23	. . . . .	. . . . .	. . . . .	. . .	. .	noon	. . . . .	58 49 04	58 47 50	
„	23 35 39.7	46 14.5	13 45 38 L	4 02	P	20 36 03	66 43 30	58 28 48	58 27 42	
24	. . . . .	. . . . .	. . . . .	. . .	. .	noon	. . . . .	58 54 30	58 53 24	

The Ice here led off the Coast, of which we had no distinct view afterwards. It has not been considered necessary to particularize the Ship's daily Latitude and Longitude on her homeward passage.

THE following Table contains the Longitude by each of the Chronometers selected for final determination in 1820; that of No. 259 being the same as is deduced from the Observations in the preceding Abstract.

The authority, on which the Daily Corrections to Mean Greenwich Time for Rate and original Difference are founded, is explained in Appendix, pages x. and xi.

The last column contains the corrected or received Longitude, being the Mean Result of the four Chronometers.

1820	228			253			254			259			Longitude by the four Chronometers.
	Time	Correction	Longitude	Time	Correction	Longitude	Time	Correction	Longitude	Time	Correction	Longitude	
	H M S	H M S	° ′ ″ W	H M S	H M S	° ′ ″ W	H M S	M S	° ′ ″ W	H M S	M S	° ′ ″ W	° ′ ″ W
Aug. 3	4 10 19.6	3 14 49.2	111 17 12	5 53 51.6	1 31 12.5	111 16 02	7 7 51.1	17 13.7	111 16 12	6 37 48.6	47 19.5	111 17 02	111 16 39
5	4 17 01.3	3 14 37.7	112 54 45	5 59 22.6	1 32 07.7	112 52 36	7 14 12.3	17 17.7	112 52 30	6 44 20.3	47 16.7	112 54 17	112 53 32
6	4 20 26.8	3 14 31.9	113 44 41	6 02 11.3	1 32 35.3	113 41 39	7 17 28.6	17 19.6	113 42 03	6 47 39.3	47 15.5	113 43 42.3	113 43 01.3
16	4 22 01.1	3 13 34.2	113 53 50	5 57 51.6	1 37 11.5	113 45 46.5	7 17 23.1	17 39.4	113 45 37	6 48 10.1	47 03	113 48 17.5	113 48 22.5
17	4 17 41.9	3 13 28.4	112 47 34.5	5 52 55.4	1 37 39.2	112 38 39	7 12 52.1	17 41.4	112 38 22.5	6 43 44.9	47 01.5	112 41 36.5	112 41 33.1
25	4 16 45.4	3 12 42.1	112 21 52	5 47 10.4	1 41 20.1	112 07 37	7 10 22.4	17 57.3	112 04 55	6 41 55.4	46 51.5	112 11 43	112 11 32
28	3 36 44.6	3 12 24.8	102 17 21	5 05 19.3	1 42 42.9	102 00 33	6 29 44.8	18 03.2	101 57 0	6 01 35.8	46 48	102 05 57	102 05 13
29	3 15 01.6	3 12 19	96 50 09	4 43 02.6	1 43 10.5	96 33 16.5	6 07 50.8	18 05.2	96 29 0	5 59 50.6	46 46.7	96 39 19.5	96 37 56
31	2 17 49.2	3 12 07.4	82 29 09	3 44 45	1 44 05.8	82 12 42	5 10 18.5	18 09.2	82 06 55	4 42 31	46 44.3	82 18 49.5	82 16 54
Sept. 3	1 34 09	3 11 50.1	71 29 46	2 59 27	1 45 28.7	71 13 55	4 26 10	18 15.1	71 06 16	3 58 38	46 40.5	*71 19 37.5*	*71 17 23.6*
7	1 23 50.8	3 11 27	*68 49 27*	*2 35 39.5*	1 58 41.7	68 35 18	4 15 15.5	18 23	68 24 37	3 48 00.5	46 35.5	*68 39 01*	68 37 06
9	1 17 57.4	*3 11 15.5*	*67 18 13*	2 28 39.4	1 59 36.9	67 04 05	4 09 05.1	18 26.9	66 53 0	3 41 57.4	46 33	67 07 36.5	67 05 43.6
11	1 14 09.5	3 11 04	66 18 23	2 23 45.3	2 00 32.1	*66 04 21*	4 05 00.3	18 30.9	65 52 48	3 37 59.3	46 30.5	66 07 28	66 05 45
12	1 13 08.35	3 10 58.2	66 01 37.5	2 22 06.3	2 00 59.7	65 46 30	4 03 51.3	18 32.9	65 36 03	3 36 52.3	46 29.2	65 50 23.5	65 48 32.5
14	1 10 55.5	3 10 46.6	65 25 32	2 18 53	2 01 55	65 12 0	4 01 24.8	18 36.8	65 00 24	3 34 30.5	46 26.7	65 14 19	65 13 04
22	0 46 37.4	3 10 00.4	59 09 27	*1 50 06.6*	2 05 35.9	58 55 37	3 36 09.8	18 52.6	58 45 36	3 09 38.6	46 17	58 58 54	58 57 23.5
23	0 46 04.3	3 09 54.7	58 59 45	1 49 01.5	2 06 03.5	58 46 15	3 35 30.5	18 54.5	58 36 15	3 09 00.5	46 15.7	58 49 04	58 47 50
24	0 46 33.8	3 09 49	59 05 42	1 48 55	2 06 31.1	58 51 32	3 35 51	18 56.4	58 41 51	3 09 23.5	46 14.5	58 54 30	58 53 24

APPENDIX IV.

ABSTRACT

OF

OBSERVATIONS ON THE DIP OF THE HORIZON AT SEA, WITH DR. WOLLASTON'S DIP SECTOR,

IN 1819 AND 1820.

ASIATIC SOCIETY MUMBAI

AN ABSTRACT of OBSERVATIONS on the DIP of the HORIZON at SEA, made in His Majesty's Ship Hecla, in 1819, with Dr. Wollaston's Dip Sector.

1819.	Latitude	Longitude	Observer	No. of Observations	Height of the Eye	Dip: Tabular	Dip: Observed	Difference, the Tabular being	Temperature: Air	Temperature: Sea	Barometer	Points of the Horizon observed	Wind	WEATHER AND REMARKS
	° ′	° ′			Ft In	′ ″	′ ″	″	°	°	IN			
May 29	57 34 N	26 08 W	P	6	19 0	4 17	4 15.25	+01.75	48.5	48.75	29.85	. . . . .	S.W.byS.	Moderate and cloudy.
,,	,,	,,	B	8	21 0	4 31	4 31.25	—00.25	49	48.5	29.9	E.&W.	W.	Horizon well defined.
,, 9A.M.	,,	,,	S	6	19 0	4 17	4 13	+04	48.5	49	29.94	N.&S.	S.W.	Overcast, with occasional drizzling rain.
June 5	55 0	36 0	P	6	18 8	4 15	4 35.8	—20.8	43	44.5	29.725	. . . . .	N.byE.	Light airs, and cloudy.
,,	,,	,,	B	6	18 8	4 15	4 48.7	—33.7	43	45.5	29.72	N.E.&S.W.	. . . . .	Ship steady; horizon well defined.
,, 1P.M.	,,	,,	R	6	18 11	4 16.5	4 40	—23.5	44	45	29.725	N.E.&S.W.	N.N.E.	Light breezes; fine clear weather; sea smooth; horizon well defined.
,, 2P.M.	,,	,,	S	8	19 0	4 17	4 39.7	—22.7	44	45	29.725	N.&S.	N.N.W.	Light airs, and cloudy.
,, 10P.M.	,,	,,	R	10	19 0	4 17	4 08	+09	44	42.5		E.N.E.&W.S.W.	W.S.W.	Cloudy near the horizon; much motion; horizon bright, and ill defined.
10	55 57	37 50	P	6	19 0	4 17	3 57.4	+19.6	44	42.5	29.85	. . . . .	N.byE.	Light airs, and cloudy.
,, 3P.M.	,,	,,	S	12	19 0	4 17	3 50.25	+26.75	44	42.5	29.85	E.N.E.& W.S.W.	W.S.W.	Wind moderate; sunshine, with light clouds.
14	57 37	41 30	P	10	19 4	4 19	3 47.7	+31.3	40	40	29.90	. . . . .	N.W.½W.	Moderate and clear.
,,	,,	,,	B	6	19 4	4 19	3 52.5	+26.5	41.4	41	29.94	N.E.&S.W.	N.	Horizon clear and well defined.
,, 10A.M.	,,	,,	R	10	19 5	4 19.5	4 06.25	+13.25	40	40	29.90	N.W.&S.E.	N.W.byW.	Horizon well defined; instrument inverted between each observation.
,, 11A.M.	,,	,,	S	10	19 4	4 19	3 47.2	+31.8	40	40	29.90	N.W.&S.E.	N.W.½W.	Light breezes, with clear sunshine.
,, 6P.M.	,,	,,	R	10	19 5	4 19.5	4 06.25	+13.25	40	40	29.95	N.W.&S.E.	N.W.byW.	Horizon very well defined.
15	57 27	43 0	P	6	21 0	4 31	4 02.5	+28.5	41	39.5	29.67	. . . . .	E.byN.	Moderate and cloudy; rain soon after
,,	,,	,,	B	4	21 0	4 31	4 04.2	+26.8	40	40	20.76	N.E.&S.W.	E.½S.	Horizon well defined.
,, noon	,,	,,	R	10	21 0	4 31	4 24	+07	40	40	29.70	N.N.W.&S.S.E.	E.byN.	Horizon exceedingly well defined.
,,	,,	,,	B	4	21 0	4 31	4 12.5	+18.5	40	40	29.76	N.E.&S.W.	E.½S.	
,, 11A.M.	,,	,,	S	12	21 0	4 31	4 23.3	+07.7	40	40	29.70	N.&S.	E.byN.	Horizons remarkably clear, distinct, and well defined; Cape Farewell, N. distant 120 miles.
16 9P.M	58 10	48 20	S	10	19 0	4 17	3 53.75	+23.25	39.5	39	29.79	N.W.&S.E.	N.W.	Sun-setting in the N.W.; horizon very distinct.
21	61 16	54 11	R	8	21 0	4 31	3 33	+58	39	41	29.53	N.N.E.&S.S.W.	S.E.byE.	Horizons indistinct
23	62 40	61 20	P	14	18 3	4 12.5	3 49.8	+22.7	32.5	32.5	29.90	. . . . .	N.byW.	Light breezes, and clear.
,,	,,	,,	B	6	18	4 11	3 27.9	+43.1	33	32.5	29.89	N.E.&S.W.	. . . . .	Sky cloudless.
,,	,,	,,	B	6	18	4 11	3 28.7	+42.3	33	32.5	29.89	N.E.&S.W.		
,,	,,	,,	R	10	18	4 11	3 57.73	+13.27	32.5	32.5	29.90	N.&S.	N.byW.	Ice seen from the mast-head N.N.W.
,, 11A.M.	,,	,,	S	10	18	4 11	3 49	+22	32.5	32.5	29.88	N.&S.	N.byW.	Thermometer in the sun 36.5: ice blink in the N.W.; observations good.
Aug. 2	74 30	79 0	S	8	17 8	4 08.8	3 37.8	+31	36	33	29.72	N.&S.	E.	In Lancaster Sound 3 or 4 icebergs being the only ice in sight; wind light and variable.

AN ABSTRACT of OBSERVATIONS on the DIP of the HORIZON at SEA, made in His Majesty's Ship Hecla, in 1820, with Dr. Wollaston's Dip Sector.

1820	Latitude	Longitude	Observer	No. of Observations	Height of the Eye	Dip: Tabular	Dip: Observed	Difference, the Tabular being	Temperature: Air	Temperature: Sea	Barometer	Points of the Horizon observed	Wind	WEATHER AND REMARKS
	° ′	° ′			Ft In	′ ″	′ ″	″	°	°	IN			
Aug. 27	75 0	97 30	P	10	19 1	4 17	3 31	−46	30.5	30.5	29.83	N.E.&S.W.	W.	Moderate and fine; a few straggling pieces of ice about the horizons.
6 & 7 P.M.	,,	,,	P	10	19 1	4 17	3 53	−24	30.5	30.5	29.83	N.E.&S.W.	W.	
,,	,,	,,	B	8	18 4	4 13	3 29.1	−43.9	29	30	29.83	N.E.&S.W.	W.	Horizons well defined.
,,	,,	,,	S	10	18 10	4 16	3 25.5	−50.5	30.5	30.5	29.83	N.E.&S.W.	W.	Fine breeze.
,,	,,	,,	S	10	18 10	4 16	3 45.25	−30.75	30.5	30.5	29.83	N.E.&S.W.	W.	
30 1½ P.M.	74 12	88 30	P	10	19 1	4 17	4 45.7	+28.7	29	31.5	29.64	N.W.&S.E.	N.W.	Moderate and clear; no ice in sight.
,,	,,	,,	B	6	22 0	4 37	4 32	−5	29	31	29.64	N.W.&S.E.	W.	Horizons well defined.
,,	,,	,,	B	6	22 0	4 37	4 30	−7	29	31	29.64	N.W.&S.E.	W.	
,,	,,	,,	S	10	18 10	4 16	4 35	+19	29	31.5	29.64	E.byN.&W.byS.	N.W.	Observations pretty good.
Sept. 23	67 15	59 0	P	20	19 0	4 17	3 32.2	−44.8	32.5	32	29.52	E.N.E.&W.S.W.	S.E.byE.	Horizons well defined; no ice in sight.
,,	,,	,,	P	12	19 0	4 17	3 43.5	−33.5	32.5	32	29.52	E.N.E.&W.S.W.	S.E.byE.	
,,	67 15	,,	P	10	19 0	4 17	3 42.2	−34.8	32.5	32	29.52	E.N.E.&W.S.W.	S.E.byE.	
28 3 P.M.	62 31	55 25	P	10	16 7	4 00	4 30.15	+30.15	33.5	41	29.43	N.E.&S.W.	W.	Moderate, with squalls of hail & snow.
,,	,,	,,	S	10	16 0	3 56	4 11.5	+15.5	33.5	41	29.43	N.N.E.&S.S.W.	N.W.	Fresh breeze, with squalls of snow.
Oct. 4 1½ P.M.	57 58	42 00	P	12	16 6	4	3 01.4	−58.6	44	43	29.74	N.&S.	S.W.byW.	Moderate and cloudy; much swell; ship rolling.
,,	,,	,,	S	12	16 6	3 56	3 27.9	−28.1	44	43	29.74	N.&S.	S.W.byW.	Ship much motion.
5 P.M.	58 0	40 25	P	12	16 6	4	3 26.4	−33.6	44	43.5	29.91	N.&S.	N.E.byN.	Ship steady; observations good.
,,	,,	,,	P	12	16 6	4	3 30.4	−29.6	44	43.5	29.91	N.&S.	N.E.byN.	
,,	,,	,,	S	12	16 6	3 59.5	3 32.1	−27.4	44	43.25	29.91	N.&S.	N.E.byN.	Clear and fine.
12 P.M.	61 17	30 15	P	10	16 6	4	3 14.5	−45.5	48	48	30.23	N.&S.	W.byS.	Water smooth; ship steady.
,,	,,	,,	S	12	16	3 56	3 33.46	−22.54	48	48	30.23	N.&S.	W.byS.	Horizons not very distinct.

The Tabular Dip is taken from Mendoza Rios. The Observers were Captain Parry, Lieutenant Beechey, Mr. Ross, and Captain Sabine.

ASIATIC SOCIETY MUMBAI

APPENDIX V.

MAGNETIC OBSERVATIONS.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

OBSERVATIONS ON THE DIP.

The Dipping Needle employed in these Observations was the Property of Henry Browne, Esq., F.R.S., and is the same which was used in the Voyage of Discovery in 1818. An Account of the Observations which were then made with it has been published in the *Philosophical Transactions* for 1819, where the Instrument itself and the mode of Observation are fully described.

The Adjustment of the Dipping Needle to the Plane of the Magnetic Meridian, by means of a detached Compass placed at a distance, having been found occasionally inconvenient, a Box containing an horizontal Needle and Card was fitted to the Instrument itself, previous to the present Expedition; the Box was removable when the Adjustment was effected.

OBSERVATIONS ON THE DIP.

1819	Latitude	Longitude	Observer	No. of Observations.	Dip	REMARKS.
March	51 31 N	00 08 W	Capt. Sabine	16	70 33.27 N	Regent's Park, London.
June 26	64 00	61 50	Capt. Parry	12	83 04.36	Davis' Strait; on ice moving in azimuth. The instrument frequently re-adjusted to the magnetic meridian.
			Capt. Sabine	12	83 04.45	
July 17	72 00	60 00	Capt. Sabine	12	84 14.9	Baffin's Bay, on ice
31	73 31	77 22	Capt. Parry	12	86 03.29	On the beach, Possession Bay.
			Capt. Sabine	12	86 04.19	
Aug. 7	72 45.15	89 41	Capt. Sabine	12	88 26.71	On the beach, East coast of Regent's Inlet.
11	72 57	89 30	Capt. Parry	12	88 24.92	On ice moving in azimuth; at the close of the observations the instrument was inclined 15° to the magnetic meridian.
			Capt. Sabine	12	88 25.42	
15	73 33	88 18	Capt. Parry	12	87 35.74	On the beach, north side of Barrow's Strait., under Limestone Cliffs, 600 or 700 feet high.
			Capt. Sabine	12	87 36.16	
28	75 10	103 44	Capt. Sabine	12	88 25.58	On Byam Martin's Island.
30	74 55	104 12	Capt. Sabine	12	88 29.12	On ice, 7 miles from the land, 400 yards from the ship.
Sept. 6	74 47	110 34	Capt. Sabine	12	88 29.91	On the beach, Bay of the Hecla and Griper; wind high with sand drift, observations indifferent.
11	74 27	111 42	Capt. Sabine	12	88 36.95	Melville Island.
Nov. 1&2 1820	74 47	110 48	Capt. Sabine	12	88 37.041	Observatory, Winter Harbour.
July 17			Capt. Sabine	12	88 43.99	
18			Capt. Sabine	12	88 43.4	
19			Capt. Sabine	12	88 43.1	
Sept. 17	68 30	64 21	Capt. Sabine	14	84 21.42	On ice in Davis' Strait.
Dec. 28	51 43	00 14	Capt. Sabine	12	70 33.5	Near London.

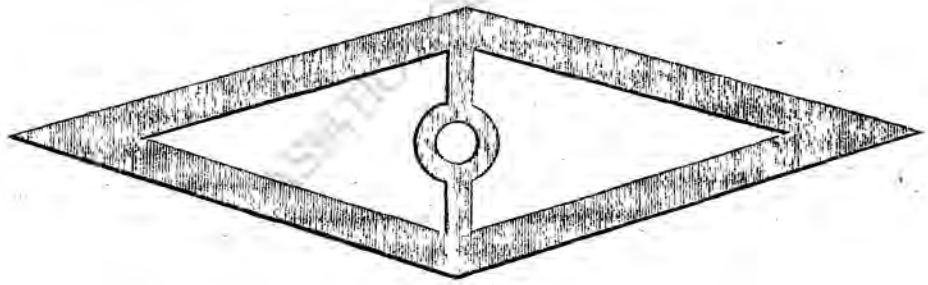
OBSERVATIONS ON THE VARIATION,

MADE ON SHORE, OR ON THE ICE, AT A SUFFICIENT DISTANCE FROM THE SHIPS TO BE BEYOND THE INFLUENCE OF THE IRON WHICH THEY CONTAINED.

The Azimuth Compasses used in these Observations were of Captain Kater's improved construction, whereof four were supplied to the Hecla, being numbered from 1 to 4, and are referred to accordingly.

These Compasses were originally constructed for the Voyage of Discovery in 1818, and are described in the *Philosophical Transactions* for 1819; a further improvement having been made in them during the equipment of this Expedition, the following particulars are added to the former Description :—

A Needle, in figure and size as represented below, has been substituted



for the straight Needle; the Card is as before, with the addition of four talc Vanes fixed beneath and perpendicular to it, and at right angles to each other; these are designed to check the Vibrations, and to cause the Needle to settle more speedily, by reason of the resistance which they experience from the air in the Compass-Box; the Needle, Card, and Vanes, with the Agate Cup and Screws, weigh altogether 173½ grains.

The Compass was placed, during Observations, on a Brass Plate, furnished with Foot Screws by which it was adjusted horizontally, as shewn by a spirit level; thus the perpendicularity of the Sight Vane was ensured; a circumstance to which it is necessary to be particularly attentive with these

Compasses; the Brass Plate and Compass were usually placed on a Copper-fastened Stool.

Unless where a particular notice is made in the Column of Remarks, the Variations are the results of Observations at suitable hours of the Magnetic Bearing of the Sun's Centre, (corrected for a small Index Error of the Compass, determined for each respectively by Captain Kater himself,) compared with the *true* Azimuth deduced either from corresponding Altitudes, or from the time of the Observation being noted by a Watch, whose Error on Mean Time was known.

The latter method is said to be but rarely practised at Sea; it may, however, frequently be of service when the former and ordinary one is inapplicable; good opportunities will sometimes occur of observing the Sun's Magnetic Azimuth, when the Horizon is either uncertain from Fog, or intercepted by Land, and when consequently the Altitude cannot be observed; moreover, in laying down a Coast by Astronomical Bearings whilst running along it, a knowledge of the Sun's Azimuth is frequently desired, not only at the times when it cannot be obtained from the Altitude by reason of the causes beforementioned, but also, and more commonly, at others when the Sun's Motion in Altitude is too slow to enable the bearing to be deduced from it with sufficient correctness; on such occasions the instant of Observation being noted by a Chronometer, or a steady-going Watch, whose Error on Time may be ascertained at a more suitable part of the day, (the difference of Longitude caused by the Ship's intermediate run being allowed,) the Azimuth may be deduced corresponding to the Observation.

There are some respects also in which this method is preferable at all times to the more usual one; the Observation is made, generally, in much less time; and the observer is independent of an assistant, since he can note the time of his own Observation himself both conveniently and accurately, and he has thus the additional advantage of depending on himself alone for the correctness of both the observed elements.

It appears desirable, therefore, that in works on Practical Navigation, which purpose to contain short and convenient Rules for all such Calculations as are most useful at Sea, a method of deducing the Azimuth from the Hour Angle should be given, as well as from the Altitude.

The Mean of several Observations, usually from six to twelve, was taken for each Result; the Compass being removed and directed afresh between every Observation.

ABSTRACT of OBSERVATIONS on the VARIATION, made on Shore, or on the Ice.

1819	Latitude	Longitude	Observer	Compass	VARIATION WEST		REMARKS
	° ′	° ′			° ′ ″	° ′ ″	
June 19	59 49 N	48 09 W	P	4	48 44 15	48 38 21	On Ice.
			B	3	48 41 30		
			H	2	48 16 26		
			S	2	48 51 12		
26	63 58	61 50	P	2	61 14 41	61 11 31	On ice, 220 yards distant from the ship.
			P	2	61 15 04		
			B	3	61 01 20		
			H	3	61 25 44		
			S	3	61 00 45		
27	63 44	61 59	B	1	60 13 00	60 20 12	On ice.
			H	1	60 25 09		
			S	1	60 22 27		
30	63 26	62 09	P	4	62 04 00	61 50 12	On ice, 200 yards distant from the ship.
			P	4	61 53 42		
			B	3	61 32 54		
,,	63 29	62 08	H	3	60 09 16	60 55 48	On ice, 200 yards distant from the ship.
			H	1	60 07 47		
			S	1	61 55 27		
			S	2	61 30 40		
July 15	70 29	59 12	S	3	74 39 00	74 39 00	On an iceberg.
17	72 00	59 56	P	3	80 11 40	80 55 27	On ice, 200 yards distant from the ship.
			B	3	80 06 30		
			H	4	81 40 18		
			H	1	81 02 58		
			S	4	81 31 42		
			S	1	80 59 35		
23	73 05	60 11½	P	2	82 52 24	82 02 40	On ice, 250 yards distant from the ship.
			P	2	81 42 32		
			B	2	82 44 08		
			H	2	81 52 39		
			H	4	80 36 33		
			S	4	80 50 18		
			S	2	82 46 44		
			S	*	82 56 00		

The Asterisks in the column entitled "Compass," denote that the Observations were made with the Variation Transit Instrument.

ABSTRACT of OBSERVATIONS on the VARIATION, made on Shore, or on the Ice, *continued.*

1819	Latitude	Longitude	Observer	Compass	VARIATION WEST		REMARKS
	° ′	° ′			° ′ ″	° ′ ″	
			P	1	81 40 51		
			B	1	82 34 50		
			H	1	82 39 10		
			S	1	82 48 23		
July 23	73 03 N	60 12½ W	S	*	82 51 26	82 37 30	On ice, 250 yards distant from the ship.
			S	*	82 54 07		
			S	*	82 45 24		
			S	*	82 43 33		
			S	*	82 39 45		
			P	3	81 21 18		
			P	2	81 43 49		
			B	2	81 49 00		
			B	2	82 09 00		
			B	3	81 45 39		
			H	1	81 35 52		
24	73 0	60 09	H	2	81 34 24	81 34 00	On ice, 250 yards distant from the ship.
			H	1	81 43 25		
			S	2	81 48 00		
			S	*	81 08 57		
			S	*	81 08 07		
			S	*	81 00 37		
			P	2	108 51 28		
			P	2	108 43 06		
31	73 31	77 22½	S	2	108 47 20	108 46 35	Possession Bay.
			S	2	108 32 00		
			S	2	108 59 03		
			H	1	107 01 08		
			H	2	107 12 43		
Aug. 3	74 25	80 08	S	1	107 08 36	106 58 05	On an iceberg in Barrow's Strait.
			S	2	106 29 52		
			B	2	118 47 55		
			B	1	119 05 00		
			H	1	117 05 44		
7	72 45	89 41	H	2	117 24 18	118 16 27	East Coast of Regent's Inlet; 100 yards from the sea.
			S	1	118 57 20		
			S	2	118 18 24		

ASIATIC SOCIETY MUMBAI

ABSTRACT of OBSERVATIONS on the VARIATION, made on Shore, or on the Ice, *continued.*

1819	Latitude	Longitude	Observer	Compass	VARIATION		REMARKS
					WEST		
	° ′	° ′			° ′ ″	° ′ ″	
Aug. 13	73 11 N	89 22½ W	P	1	115 15 26	114 16 43	On ice.
			B	1	114 18 30		
			H	1	113 59 58		
			S	1	113 33 00		
15	73 33	88 18	P	2	115 23 27	115 37 12	On the beach; east coast of Regent's Inlet.
			P	2	115 35 20		
			P	2	116 22 59		
			H	2	115 43 40		
			H	2	116 04 23		
			H	2	114 30 45		
			H	2	114 46 56		
			H	2	116 20 29		
			H	2	116 04 21		
			S	2	115 45 04		
			S	2	115 25 15		
			S	2	115 23 45		
22	74 40	91 47	H	2	128 43 54	128 58 07	On the beach; at Cape Riley.
			S	2	129 12 20		
					EAST.		
28	75 09	103 44½	S	2	165 32 00	165 50 09	S.E. point of Byam Martin's Island.
			S	2	166 08 18		
Sept. 1	75 03	105 54½	B	1	159 00 30	158 04 13	On ice.
			B	2	156 57 07		
			H	1	159 06 05		
			H	2	156 50 44		
			S	1	159 18 20		
			S	2	157 12 30		
2	74 58	107 03	P	2	155 51 32	151 30 03	On Melville Island, near Point Ross.
			H	2	148 53 21		
			S	2	150 16 00		
			S	2	150 59 20		
6	74 47	110 34	S	1	126 17 18	126 17 18	On the beach, in the Bay of the Hecla and Griper.
15	74 28	111 42	P	1	118 50 00	117 52 22	On the beach, Melville Island.
			P	2	119 16 36		
			S	1	117 24 18		
			S	2	115 58 35		

OBSERVATIONS to determine the VARIATION, during an Excursion into the Interior of Melville Island, North Georgia.

1820	Latitude	Longitude	Observer	Compass	EAST VARIATION		REMARKS
	° ′ ″	° ′ ″			° ′ ″	° ′ ″	
June 3	75 06 52 N	110 27 40 W	P	2	129 22 59	128 30 14	
„	75 06 52	110 27 40	S	2	127 37 30		
7	75 34 47	110 35 52	P	2	135 03 58	135 03 55	
„	75 34 47	110 35 52	S	2	135 03 52		
11	75 12 50	111 51 54	P	2	125 01 52	125 15 22	
„	75 12 50	111 51 54	S	2	125 28 53		
12	75 05 18	111 56 58	P	2	122 59 37	123 47 58	
„	75 05 18	111 56 58	S	2	124 36 20		
13	75 02 37	111 37 10	S	2	126 01 48	126 01 48	
15	74 48 33	111 11 49	P	2	123 16 01	123 05 30	
„	74 48 33	111 11 49	S	2	122 55 00		

OBSERVATIONS to determine the Variation at Winter Harbour, Melville Island, Latitude 74° 47′ 13″ N., Longitude 110° 49′ 0″ W.

1819 and 1820	Observer	No. of Observations	Compass	Barometer	Thermometer	Variation, East		REMARKS
				IN.	°	° ′ ″		
October 25	P	5	1	30.13	+14	126 27 24		
1 to 3 P.M.	P	5	2	. . .	. . .	127 13 00		
,,	P	5	4	. . .	. . .	128 14 12		
,,	S	5	1	. . .	. . .	125 58 00		
,,	S	5	2	. . .	. . .	126 45 00		
,,	S	5	4	. . .	. . .	126 45 00		
November	B	6	4	. . .	−37	127 51 00		
1820, January 26,	S	7	1	29.70	−34	126 36 25		
at 1 P.M.	S	7	1	29.70	−34	126 09 00		
27, 2 P.M.	S	7	2	29.90	−38	126 54 00		
April 28, 7½ A.M.	P	5	3	30.73	− 2	126 54 00		
5 to 6 P.M.	P	5	2	30.51	+ 9	127 57 00		
	P	3	3	. . .	. . .	128 19 20		
April	B	5	2	. . .	+ 4	126 13 00		
,,	B	3	3	. . .	. . .	127 34 00		
July 24, 9½ A.M.	P	9	1	29.70	+43	128 13 47		These observations are the difference between the true and magnetic bearing of a meridian mark.
9.55	P	9	3	. . .	to	128 33 52		
10.35	P	9	1	. . .	+47	127 49 53		
11	P	9	1	. . .	. . .	128 51 00		
11.20	P	9	1	. . .	. . .	128 08 13	° ′ ″ 127 47 50	
11.40	P	7	1	. . .	. . .	127 37 26		The Compasses were removed, directed, and levelled afresh, between every observation.
July 25,	P	9	1	29.56	+48	128 38 13		
10 to 11½ A.M.	P	9	1	. . .	to	127 48 47		
,,	P	9	2	. . .	+43	128 03 00		
,,	P	9	2	. . .	. . .	127 45 47		
,,	P	9	1	. . .	. . .	127 36 33		
,,	P	9	1	. . .	. . .	127 51 33		
,,	P	9	2	. . .	. . .	128 30 47		
,,	P	9	2	. . .	. . .	128 11 53		
,,	P	9	2	. . .	. . .	127 50 58		
,,	P	9	1	. . .	. . .	128 18 58		
July 27,	S	10	2	29.76	+39	127 33 50		
4 to 8 A.M.	S	10	1	. . .	. . .	128 21 15		
,,	S	10	2	. . .	. . .	128 05 05		
,,	S	10	1	. . .	. . .	127 50 00		
,,	S	10	2	. . .	. . .	127 37 02		
,,	S	10	1	. . .	. . .	127 19 50		
July	B	5	1	. . .	+37	130 45 00		
,,	B	4	3	. . .	. . .	130 05 00		

The hours have been noticed at which the preceding observations were made, because the results obtained at different times of the day agree sufficiently with each other, to justify an inference, that no very considerable diurnal change took place in the direction of the needle.

A Variation Needle, made by Mr. Dollond, being the property of Henry Browne, Esq. F. R. S., who was kind enough to spare it for the occasion, had been embarked with the other instruments; it had been used in England to observe the amount of the hourly changes in the variation, which it did with much accuracy; but the needle being nearly a foot in length, and being suspended in the customary manner, by an agate cup on a metal point, the friction on the point was too great to be overcome by the directive power of magnetism, when the dip had increased to 88° or 89°; the instrument was therefore quite useless at Winter Harbour.

It may indeed be justly regarded with surprise, that under so great a diminution of the magnetic influence, any compass should have still been found to traverse; and it is therefore deserving of especial notice, that even in such extreme circumstances, Captain Kater's excellent compasses, when used on shore, and with patience and attention to frequent tapping, indicated the meridian with very tolerable precision; the greatest difference of any two in ten observations not exceeding between three and four degrees.

The inference which has been drawn above, that the diurnal changes were not very considerable, may be strengthened by a remark, that had they been so they could scarcely have failed to have been observed by the instrument for ascertaining the intensity of the magnetic force, which was frequently left for days together in the observatory, and carefully watched. The needle of this instrument was suspended by a silk line within a graduated ring; and, though not equal to the measurement of small changes, would certainly have shewn them had they exceeded a degree in amount.

OBSERVATIONS on the VARIATION made on Shore, or on Ice, during the Navigation of 1820.

1820	Latitude	Longitude	Observer	Compass	VARIATION		REMARKS
					EAST		
Aug. 5	74 24 N	112 53 W	P	3	112 20 47	110 56 11	On Melville Island.
,,	74 24	112 53	S	3	109 31 35		
10	74 26	113 48	P	2	103 15 52	106 06 38	On Melville Island.
,,	74 26	113 48	B	2	108 05 20		
,,	74 26	113 48	B	2	107 09 0		
,,	74 26	113 48	B	2	107 59 20		
,,	74 26	113 48	S	2	105 05 0		
11	74 26	113 48	P	2	104 45 24		
,,	74 26	113 48	B	2	106 11 13		
,,	74 26	113 48	S	2	106 22 00		
17	74 25	112 41	P	2	115 36 51	111 19 15	On Melville Island, West of Cape Providence.
,,	74 25	112 41	P	2	114 50 10		
,,	74 25	112 41	B	2	110 01 25		
,,	74 25	112 41	B	2	110 27 15		
,,	74 25	112 41	H	2	111 05 46		
,,	74 25	112 41	H	2	109 33 20		
,,	74 25	112 41	S	2	111 30 0		
,,	74 25	112 41	S	2	111 05 0		
18	74 25	112 41	P	2	111 29 37		
,,	74 25	112 41	P	2	113 01 20		
,,	74 25	112 41	P	2	110 54 30		
,,	74 25	112 41	P	2	107 48 10		
,,	74 25	112 41	P	2	107 47 40		
25	74 27	112 11	P	2	115 56 50	114 34 45	On Melville Island.
,,	74 27	112 11	S	2	113 12 40		
					WEST		
Sept. 3	71 16	71 18	H	2	90 54 05	91 28 32	On the West Coast of Davis' Strait.
,,	71 16	71 18	S	2	92 03 00		
7	70 22	68 37	P	2	81 02 31	80 59 17	At the Esquimaux Huts, in the Inlet called the River Clyde.
,,	70 22	68 37	P	2	81 21 14		
,,	70 22	68 37	S	2	80 34 05		

OBSERVATIONS

ON THE VARIATION, AND ON THE IRREGULARITIES IN THE DIRECTION OF THE NEEDLE, OCCASIONED BY THE ATTRACTION OF THE SHIP'S IRON;

MADE ON BOARD H. M. S. THE HECLA, 1819—1820.

In the course of these observations, two objects were designed to be kept in view; it was requisite, first, for the purposes of navigation, that the amount of the variation on the courses steered by the ship should be known, that her true direction might be deduced from that indicated by the compass; and secondly, to these necessary observations, it was desired to add such as could be made without material inconvenience or delay with the ship's head placed on other points than those of her immediate courses, for the purpose of exemplifying more extensively than had been done heretofore, the irregularities which take place in the direction of compass needles, in consequence of the attraction of the iron contained in ships.

Experience in the voyage of the Isabella and Alexander in 1818, had shewn the *necessity* in high magnetic latitudes of adopting an expedient originally suggested by Captain Flinders, *viz.*, the selection of some one spot in the ship as the permanent position of a standard compass, in which it should be invariably placed for use, whether in observing azimuths, or bearings of land, or in directing the ship's course; and that if on any particular occasion, it should be necessary to use a compass in any other part of the ship, a reference should be made to the standard by comparison, and the difference (if any) in its pointing noted and allowed for; a certain degree of uniformity being found to obtain in the effects of the local attraction on a compass thus confined to one spot, enabling a navigator by occasional observations and the aid of such practical rules as former experiments had suggested, to form a sufficiently correct judgment of the different amounts of variation to be allowed with it on each change in the direction of the ship's head. It was considered, that a series of observations, shewing the uniform nature of these effects on a standard compass might prove of service, in confirming and giving confidence to the inferences which had been drawn from former experiments, and might possibly conduce towards an improvement of the rules which had been founded on their results.

Moreover, as it was known that the amount of irregularity on each and

every direction of the ship's head varies (all other circumstances remaining the same) as the dip of the needle increases or diminishes, and in a ratio of which it would be desirable to afford a practical exemplification, it was essential that the local attraction influencing the compass used in the observations made for this purpose in different parts of the world, should be preserved, as far as might be possible, uniform and steady both in its direction and in its *absolute* force; in which case, and in which alone, the increase or decrease of its effects on the needle could be taken as the measure of its alteration in *relative* strength to the directive power of the earth's magnetism, proportioned to changes in the amount of dip; and so far as this steadiness of local attraction can be maintained on board a ship, it can only be with a compass used always in one and the same spot.

Accordingly whilst the Hecla was fitting at Deptford, Captain Parry selected a position for a standard compass; a three-legged copper-fastened stool was placed exactly amidships on the gun-room sky-light, the legs being properly secured by cleets; the middle of the stool was bored to receive the central pivot of Walker's azimuth compass-box; the height at which the compass was thus supported was as great as the convenience of an observer standing on the sky-light would admit, being $4\frac{1}{3}$ feet, or six feet two inches altogether above the deck; this elevation was considered as advantageous, not only as it gave the compass a greater command over objects to which it could be directed, but also as it diminished the liability to occasional disturbance from implements and other moveable iron, which were necessarily kept on deck, and which were thus brought so far beneath the horizontal suspension of the needle, as to have their influence greatly lessened when not altogether destroyed.

As an additional precaution, much care was taken whilst the ship was fitting, to substitute copper instead of iron work and fastenings, to as great an extent around the position of the compass as could be done with propriety. And at Captain Parry's request, brass guns were supplied for the after-part of the Hecla's deck, instead of the iron ones, which were part of her equipment.

On the 4th of May the fitting of the ship being completed, her stores embarked and distributed according to the disposition in which it was designed they should remain, a course of experiments were made at Northfleet in the River Thames, to ascertain the effects produced by the iron she had on board on the standard compass.

EXPERIMENTS AT NORTHFLEET, MAY 4, 1819.

One of Captain Kater's Azimuth Compasses being taken on Shore, was so placed as to have the Ship and a distant Steeple on the opposite side of the River in one, whence the true Magnetic Bearing of the Steeple from the Ship was found, on repeated Trials, N 83° 30′ E. The Ship's Head was then warped successively on each Point of the Compass, (excepting on the West, W. by S., and W. S. W., the Wind and Tide not permitting her to remain on those Points,) and the Bearing of the Steeple noted by the Ship's Standard Compass.

Ship's Head	Bearing of Steeple	Difference from the true Magnetic bearing	Ship's Head	Bearing of Steeple	Difference from the true Magnetic bearing
North	N 83 45 E	0 15 E.	South	N 84 00 E	0 30 E
N. by E.	N 82 30 E	1 0 W.	S. by W.	N 84 30 E	1 00
N.N.E.	N 81 30 E	2 0	S.S.W.	N 84 30 E	1 00
N.E. by N.	N 80 50 E	2 40	S.W. by S.	N 85 00 E	1 30
N.E.	N 79 15 E	4 15	S.W.	N 85 15 E	1 45
N.E. by E.	N 79 25 E	4 05	S.W. by W.	N 86 30 E	3 00
E.N.E.	N 79 30 E	4 0	W.S.W.	Points not observed	
E. by N.	N 78 49 E	4 41	W. by S.		
East	N 78 49 E	4 41	West		
E. by S.	N 79 45 E	3 45	W. by N.	N 87 45 E	4 15
E.S.E.	N 80 15 E	3 15	W.N.W.	N 87 00 E	3 30
S.E. by E.	N 80 45 E	2 45	N.W. by W.	N 86 30 E	3 00
S.E.	N 83 00 E	1 30	N.W.	N 86 15 E	2 45
S.E. by S.	N 82 15 E	1 15	N.W. by N.	N 85 55 E	2 25
S.S.E.	N 83 15 E	0 15	N.N.W.	N 85 45 E	2 15
S. by E.	N 84 00 E	0 30 E.	N. by W.	N 84 15 E	2 45

Dip of the Needle 70° 30′ N.

It was evident from these experiments that the common centre of attraction of the ship's iron was forward and very nearly a-midships; and that consequently, when the ship's head was north or south by the compass, the direction of the earth's magnetism and of the local attraction coinciding, the compass indicated the true magnetic bearing of objects.

The true variation of the Needle, therefore, could be at all times ascertained by azimuths observed with the ship's head on either of those points; when the error with which the result might be affected from local attraction might be reasonably expected not to exceed the other incidental errors to which such observations are necessarily liable.

It was also seen that the greatest deviation took place when the ship's head was on the east or west points, or in other words, when the two attractions were at right angles to each other; and that it diminished regularly as the direction of the local attraction approached that of the magnetic meridian.

It may be remarked indeed of these, as it has been of similar observations made in the former voyage, that the errors on the points equidistant from north or south (or from the line of no error) do not in all instances exactly correspond; the discordancies are, however, within the limit of inaccuracies arising from accidental causes; such as the motion of the ship; the difficulty of retaining her head steadily and precisely on the required point; the imperfection of the compass itself, and especially of its graduation which is rarely carried to a smaller division than 20 minutes. These causes are sufficient to defeat an attempt at precision in compass bearings observed from ships, without including the parallax on warping the vessel round, which ought to be prevented by the distance of the selected object.

With the knowledge thus acquired of the points of greatest deviation, and of those on which none took place, and with occasional azimuth observations from time to time, as opportunities presented themselves, the irregularities in the direction of the compass proceeding from the ship's iron, occasioned no other practical inconvenience in her navigation, than a little additional trouble in computing the day's works.

Whenever it could be done, the variation on a particular course steered was ascertained by actual observation; but where the courses were many in the 24 hours, one set of azimuths with the ship's head on the north or south points shewing the true variation, and a second set, with her head either on the east or west points shewing the maximum of disturbance, were

sufficient with a very little practice to enable the variation to be assigned for every point of the compass, without a reference to tables or to computation, and with quite as much accuracy as was necessary for the practical purposes of navigation, which, as the compass was not referred to in surveying, the position of all lands being determined by astronomical bearings, was, in fact, its only use on board.

ASIATIC SOCIETY MUMBAI

OBSERVATIONS ON THE VARIATION,

MADE AT SEA IN H. M. S. HECLA, 1819.

The Compasses used in these Observations were placed invariably on the stand which has been described as the position of a standard Compass.

Walker's Azimuth Compass was used, unless where it is otherwise noted in the column of Remarks.

The Latitudes and Longitudes are of the place of Observation, and were deduced by the Ship's Log from the nearest observed.

The Initials in the column specifying the Observer, are those of Captain Parry, Lieutenant Beechey, Mr. Hooper, and of Captain Sabine.

OBSERVATIONS on the VARIATION, made at Sea, in H. M. S. Hecla, 1819.

1819	Latitude	Longitude	Ship's Head.	Observer	VARIATION, WEST		REMARKS
	° ′	° ′			° ′		
				P	25 42		
May 18	57 09 N	1 02 W	N. ½ E.	B	26 27	26 38	
				H	27 45		
				P	27 02		
19	58 24	1 25	N.N.E.	B	27 15	27 08	
				P	36 19		
				P	35 56		
21	59 26	4 50	W.N.W.	B	36 39	36 22	
				S	36 22		
				S	36 33		
				P	37 32		
				P	37 55		
22	59 00	7 26	W.N.W.	B	38 31	38 14	
				H	38 37		
				S	38 38		
				P	40 23		
				P	40 37		
24	57 42	14 16	W.N.W.	B	40 39	40 47	Amplitude.
				B	41 32		
				S	40 46		
				P	42 31		
				B	43 11		
25	57 17	16 30	W.N.W.	H	42 50	43 00	
				S	43 27		
			N.W.	P	45 12		
27	56 52	23 40	N.W.byN.	B	43 20	43 33	
				S	43 46		
			North	B	41 20		
28	57 22	25 12	N.byE.	P	39 20	39 34	
				S	39 49		
			N.N.E.	H	39 29		
31	58 14	30 27	N.W. ¼ W.	H	51 12		
				P	38 26		
				P	39 09		
June 4	55 01	35 27	N.E.	H	37 45	38 14	
				H	37 37		

OBSERVATIONS on the Variation, made at Sea, in H. M. S. Hecla, 1819, *continued*.

1819	Latitude	Longitude	Ship's Head.	Observer	VARIATION, WEST		REMARKS
	° ′	° ′			° ′	°	
			N.W.byN.	B	41 27	42 35	
				H	43 43		
June 5	55 03 N	36 00 W		P	42 46	42 27.5	
			N.N.W.	H	42 09		
			S.W.½S.	S	46 37		
			S.W.	H	47 17		
7	55 48	37 15	W.S.W.	P	48 08		
			West	B	50 20		
				P	51 44		
				P	51 18		
				B	52 14	51 31	
9	55 42	37 53	W.byN.	H	51 10		
				H	50 53		
				S	51 45		
				P	45 00		
				P	44 56		
10	56 08	38 00	North	H	44 23	44 49	
				H	44 29		
				S	45 20		
				P	38 44		
				P	39 22		
10	55 46	38 09	N.N.E.	B	38 57	39 40	
				H	40 58		
				S	40 18		
11	56 09	40 00	North	H	43 02		
11	56 37	40 22	N.byW.	P	47 04		
				B	46 40		
11	56 39	40 22	N.byW.½W.	H	47 49	47 18	
				S	47 26		
				P	45 44		
				B	46 50	46 29	
			North	H	46 41		
				S	46 43		
				P	38 08		
				B	39 20		Observations of this day very good.
13	57 55	40 57	East	H	40 25	39 36	
				S	39 30		

OBSERVATIONS on the Variation, made at Sea, in H. M. S. Hecla, 1819, *continued.*

1819	Latitude	Longitude	Ship's head	Observer	VARIATION, WEST		REMARKS.
	° ′	° ′			° ′	° ′	
			South	P	45 42	46 40.5	Observations of this day very good.
				B	46 47		
				H	47 05		
June 13	57 55	40 57		S	47 08		
			W.S.W.	P	52 04	52 17	
				B	52 23		
				H	52 42		
				S	51 59		
			N.W.byW.$\frac{1}{2}$W.	S	53 35		
			N.W.byW.	H	52 01		
14	57 42	41 30	N.W.$\frac{1}{2}$W.	B	50 37		
			N.W.	P	50 07		
			W.N.W.	P	54 47	54 30	
				B	54 37		
„	57 30	42 12		H	53 51		
				S	54 45		
			N.W.$\frac{1}{2}$W.	B	55 43	55 32	
				H	55 22		
16	58 11	48 20		S	55 31		
			N.W.$\frac{1}{2}$N.	P	54 15		
17	58 19	48 29	N.E.byN.	S	45 59		
„	58 29	48 25	N.E.$\frac{1}{4}$N.	H	45 43		
„	58 42	48 21	N.E.$\frac{2}{4}$N.	P	45 53		
„	58 43	48 21	N.E.$\frac{1}{2}$N.	B	45 27		
„	58 39	48 21	N.E.$\frac{3}{4}$N.	S	45 23		
19	59 49	48 09	North	H	49 13	49 13.5	During a calm; true variation observed on the ice 48° 38′.
				S	49 14		
			N.byW.$\frac{1}{2}$W.	S	59 21		
21	61 24	54 45	N.byW.$\frac{1}{4}$W.	P	57 40		
			N.byW.	B	58 38	58 50	Much motion.
				H	59 03		
			N.byW.	P	62 36		
23	62 45	61 39	N.$\frac{1}{2}$W.	B	61 19	61 26	
				B	61 20		
				H	60 57		
				S	62 07		

OBSERVATIONS on the Variation, made at Sea, in H. M. S. Hecla, 1819, *continued*.

1819	Latitude	Longitude	Ship's Head	Observer	VARIATION, WEST		REMARKS
	° ′	° ′		P	° ′ 49 49		
			N.N.E.	H	50 17	50 11	
June 23	62 50 N	61 40 W		S	50 29		
			N.N.E.½E.	B	50 30		
24	63 30	61 43	E.N.E.	H	45 44		
			N.10°E.	B	58 48		The true variation observed on the ice, in Lat. 63° 58′, & Long. 61° 50′ was 61° 11′ 30″.
26	64 00	61 50	N.byE.½E.	P	54 29		
				H	55 43	55 06	
28	63 40	62 10	N.59°E.	B	49 11		The true variation observed on the ice in Latitude 63° 44′, Longitude 61° 30′ was 60° 20′.
				P	47 52		
				P	47 44		
30	63 26	62 08	N.86°E.	B	48 25	48 05	True variation observed on the ice 61° 23′.
				S	48 20		
				P	49 01		
July 1	64 01	60 55	E.N.E.	B	49 28	49 14.5	
,,	64 00	60 55	N.81°E.	H	48 49		
				P	50 28		
,,	64 02	59 45	East	B	50 51	50 39	
,,	64 04	60 50	E.¼S.	S	51 11		
5	66 50	57 12	E.byS.	P	51 59		
			N.byW.¼W.	B	71 30		Needle traversing sluggishly
				H	69 21		
6	67 42	57 35	N.byW.	H	70 02	69 41.5	
			N.9°W.	P	72 43		
			N.¼W.	S	69 43		
				P	57 08		
,,	67 49	57 55	E.N.E.	B	60 09	58 38.5	
,,	67 52	57 56	East	S	60 42		
				P	60 11		
			N.E.byN.	B	60 19	60 15	
7	68 21	57 02		H	55 44		
			N.70°E.	H	55 58	55 51	
,,	68 29	57 06	N.19°E.	S	67 13		
				P	64 19		
			N.byE.	H	66 01	65 10	
8	68 28	57 17					
			N.byE.½E.	B	64 51		

OBSERVATIONS on the Variation, made at Sea, in H. M. S. Hecla, 1819, *continued.*

1819	Latitude	Longitude	Ship's Head	Observer	VARIATION, WEST	REMARKS
	° ′	° ′			° ′	
July 10	69 03 N	57 58 W	North	P	67 23	
				B	68 16	67 49.5
14	70 08	58 00	N.N.E.$\frac{1}{2}$E.	B	64 55	
16	70 43	59 25	N.E.	P	69 13	The true variation observed on the ice in latitude 70° 29′, and longitude 59° 12′ was 74° 39′.
				B	67 34	68 47
				H	69 33	
21	72 56	58 37	N.byE.	P	72 32	
			N.N.E.	B	70 56	
				H	71 15	71 05.5
			N.67 W.	H	99 42	
22	73 13	60 15	N.28 W.	B	92 04	
				H	90 33	91 18.5

On the 24th of July, the ship being enclosed by extensive fields of ice, and having just water sufficient to admit of her head being warped round on the different points of the compass, a series of Observations were made corresponding to those of the 4th of May, in the River Thames.

The needle of Walker's Azimuth Compass, which had been hitherto in use, had now become so sluggish and uncertain in its direction that it was removed, and a card, which had been sent on trial by Mr. Jennings, patentee of the Insulating Compasses, substituted in its place; this card was furnished with two needles crossing each other at right angles, the division of North on the card being intermediate between the North Poles of the Needles. Mr. Jennings had conceived that such a compass might possibly be affected, by the disturbing influence of the ship's iron, in a different manner from other compasses; but this did not prove the case, its results differing from those obtained with one of Captain Kater's Azimuth Compasses, not more than such observations will differ on repetition, with the same compass in ships in high magnetic latitudes; Mr. Jennings's Card, however, notwithstanding the weight of the two needles, and of the card itself, which was a heavy one, traversed much better than Mr. Walker's, and was continued in ordinary use until the ships had ascended Barrow's Straits; when, from the near

approach to the Magnetic Pole, the Dip exceeding 88°, the directive influence of the Earth's Magnetism on the compass needle became insufficient to remove it from the direction which it assumed by reason of the attraction of the ship's iron, and in which it remained stationary under every change in the ship's course.

The Observations with Captain Kater's and with Mr. Jenning's compasses are distinguished by the respective initials K. and J., a Mean of the two being taken as the Variation on the different points; both compasses were used successively in the same place; the ship was sufficiently steady to admit of the use of a Spirit Level to ensure the horizontal adjustment of Captain Kater's; the direction of the ship's head was determined by a compass in the binnacle agreeing with those used in obtaining the Results, and frequently noted to do so during the Observations. The true Variation obtained on the ice, at a distance from the ship, was 82° 00′ by a Mean of Observations on the 23rd and 24th. The Dip had been observed in latitude 72° 00′, and longitude 60° 15′, to be 84° 15′, and had probably increased a few minutes in the ship's intermediate run.

EXPERIMENTS in BAFFIN'S BAY, Lat. 73° 00′ N., Long. 60° 09′.

Ship's Head	VARIATION, WEST		Deviation	Ship's Head	VARIATION, WEST		Deviation
	° ′	° ′	° ′		° ′	° ′	° ′
N.	81 32 K 80 56 J	81 14	0 46 E	S.	80 36.5K 81 06 J	88 51.5	0 08.5E
N.N.E.	75 04 K 75 59 J	75 31.5	6 28.5E	S.S.W.	83 46 K 81 54 J	82 50	0 50 W
N.E.	70 45 K 71 30 J	71 08	10 52 E	S.W.	87 44 K		5 44 W
E.N.E.	65 49 K 66 25 J	66 07	15 53 E	W.S.W.	93 36 K 93 45 J	93 40	11 40 W
E.	66 11 K 67 39 J	66 55	15 05 E	W.	95 44 K 96 12.5 J	95 58	13 58 W
E.S.E.	69 03 K 68 30 J	68 47	13 13 E	W.N.W.	93 11 K 95 15 J	94 13	12 13 W
S.E.	73 35 K 72 38 J	73 06.5	8 53.5E	N.W.	89 49 K 92 35 J	91 12	9 12 W
S.S.E.	76 05 K 75 34.5 J	75 50	6 10 E	N.N.W.	86 03 K 88 49 J	87 26	5 26 W

OBSERVATIONS on the VARIATION, made at Sea in H. M. S. Hecla, 1819, *continued.*

1819	Latitude	Longitude	Ship's Head.	Observer.	VARIATION, WEST		REMARKS
	° ′	° ′			° ′		
July 30	74 01	75 00	N.5°E.	H	94 32 J		
			N.N.E.½E.	P	86 47 J		
30	73 53	75 50	N.byW.½W.	P	104 48 J	106 02	
				B	108 12 J		
				H	106 03 J		
				S	105 04 K		
Aug. 6	73 51	89 07	N.15°E.	B	112 23 K		
7	72 54	90 22	N.20°W.	P	137 12 K		
			N.18°W.	B	132 24 K		
			N.15°W.	H	132 58 K		

OBSERVATIONS on the VARIATION, made in H. M. S. the Hecla, 1820.

Date	Latitude	Longitude	Ship's Head	Observer	VARIATION, WEST	REMARKS
	° ′	° ′			° ′	
Sept. 4	71 10 N	70 42 W	West	P	111 23	
,,	71 07	70 42	West	B	110 02	
5	70 48	69 00	S.W.$\frac{1}{2}$W.	P	100 47	
9	69 40	67 15	W.byN.$\frac{1}{2}$N.	P	96 07	
12	68 18	66 13	S. 30° W.	B	84 29	
13	68 15	66 15	N.W.byN.	B	83 15	
14	68 24	65 15	S.W.byW.	B	87 57	
			S.W.byS.	P	80 19	
			S.W.	P	81 08	
			S.W.byW.	P	83 10	
			W.S.W.	P	85 32	
			W.byS.	P	85 42	
15	68 28	63 23	W.	P	87 48	
			W.byN.$\frac{1}{2}$N.	P	89 02	
			W.N.W.	P	87 16	
			N.W.byW.	P	88 03	
			N.W.	P	84 49	
			W.	B	82 56	
			W.	P	82 50	
22	67 30	58 49	W.	S	83 31	
			S.	P	71 07	
			S.	S	71 01	
23	67 08	58 07	N.W.byW.	P	80 20	
,,	67 00	57 47	N.W.$\frac{1}{2}$W.	B	79 20	
24	66 42	58 56	W.byN$\frac{1}{2}$N.	P	82 00	
,,	66 40	58 29	W.N.W.$\frac{1}{2}$W.	B	83 29	
Oct. 4	57 56	42 22	S.E.byE.$\frac{1}{2}$E.	P	40 55	
				B	41 22	
5	58 03	40 47	S.S.W.	P	49 01	
10	59 53	34 11	E.$\frac{1}{2}$N.	P	39 11	
,,	59 54	34 08	E.$\frac{1}{2}$N.	B	39 04	
11	61 09	31 45	S.E.$\frac{1}{2}$E.	P	43 53	
,,	61 08	31 32	S.E.$\frac{1}{2}$E.	P	43 59	
13	60 35	25 36	S.E.byS.	P	40 22	
19	57 48	17 50	East	P	30 57	
23	58 57	11 37	E.$\frac{1}{2}$S.	B	29 36	
,,	58 56	11 35	E.S.E.	P	29 10	
26	59 56	4 28	E.S.E.	P	26 10	
,,	59 54	4 13	E.$\frac{1}{2}$N.	P	24 29	

OBSERVATIONS on the INTENSITY of the MAGNETIC FORCE,

With Mr. BROWNE'S *Dipping Needle.*

1819, March. In the Regent's Park, London, Latitude 51° 31′ 40″ N., Longitude 0° 08′ W. Dip 70° 33.3 N.

IN THE MAGNETIC MERIDIAN.

No. of Vibrations	Interval												
	M S		Interval	s	50	49	48	49	48	47	48	48.5	47	47
100	8 01.5		Arcs	° 71	55	40	30	23	17	13	9	6	3	1
100	8 08		No. of Vibrations		10	10	10	10	10	10	10	10	10	10
100	7 56.5													
100	8 02	Mean												

PERPENDICULAR TO THE MERIDIAN.

No. of Vibrations	Interval												
	M S		Interval	s	52	52	49.5	49.5	49	48.5	49.5	48.5	50.5	49.5
			Arcs	° 90	55	40	30	22	16	11	7	4	2	1
100	8 18.5		No. of Vibrations		10	10	10	10	10	10	10	10	10	10

1820, July. In the Observatory, Winter Harbour, Latitude 74° 47′ 19″ N., Longitude 110° 48′ 30″ W. Dip 88° 43.5 N.

IN THE MAGNETIC MERIDIAN.

No. of Vibrations	Interval												
	M S		Interval	s	48.5	46.5	45	44.5	44	43.3	43.5	43.2	43.8	43.2
100	7 27.2		Arcs	° 88	67.5	53.5	41.5	33	26.5	21	15.5	12.5	9.5	6.5
100	7 26.5		No of Vibrations		10	10	10	10	10	10	10	10	10	10
100	7 25.5													
100	7 25.8													
100	7 26.25	Mean												

PERPENDICULAR TO THE MERIDIAN.

No. of Vibrations	Interval												
	M S		Interval	s	49.7	46.8	44.5	44.5	44	44	43.8	43	43.2	43.5
100	7 27		Arcs	° 90	78	54	43	34	27	22	17	13	10	8
100	7 25.8		No. of Vibrations		10	10	10	10	10	10	10	10	10	10
100	7 26.4	Mean												

1820, December. In the Regent's Park, London, Latitude 51° 31′ N., Longitude 0° 08′ W. Dip 70° 33′.3 N.

IN THE MAGNETIC MERIDIAN.

No. of Vibrations	Interval		Interval	s′	51	50	50	48.5	48	47.5	46.5	46.5	46	46
	M s													
100	8 02		Arcs	° 70	46	36	28	21	16	12	9	7	5	3
100	7 58													
100	8 00		No. of Vibrations	10	10	10	10	10	10	10	10	10	10	
100	8 00	Mean												

WITH NEEDLES SUSPENDED HORIZONTALLY.

The Needles used in these Experiments were bars of Steel of seven inches in length, 0.25 in breadth, and 0.15 in thickness, magnetized to saturation previous to the voyage, and their magnetism not interfered with subsequently.

Three such bars had been provided, numbered from 1 to 3, whereof Nos. 2 and 3 were kept together when not in use, with their opposite poles connected; No. 1 was kept by itself.

Each of the Needles successively was placed for use in an instrument made for the occasion; consisting of a circular plate of ten inches diameter, centred as usual, and adjusted horizontally by foot screws, as shewn by spirit levels fixed at right angles to each other; a graduated ring, eight inches in diameter, was attached to the plate, and rose half an inch above it; on the outside of the ring were three pillars nine inches in height, bearing a tripod, from the centre of which, a stirrup was suspended by a silk line. The needle being slid into the stirrup until it balanced horizontally, and being left to itself, and the instrument protected from the air by a bell-glass, it indicated, on settling, the Magnetic Meridian. The brass plate was then

moved in Azimuth until the Zeros of the ring coincided with it, when the Needle being removed, and a brass bar subsituted in the stirrup, all twist was taken out of the silk, and the point of suspension adjusted (it having a motion for that purpose) until the brass bar rested in the same direction as the Needle had done; the Needle being then replaced, was drawn by a magnet 60° from its natural direction, released, and suffered to vibrate until the arcs became too small to be discerned; the time and arc being noted at each tenth vibration.

The whole instrument was of brass; the silk line consisted of as few fibres of raw silk as were sufficient to support the weight of the Needle, the length of the suspension being about nine inches.

May 1819. On the Sea Beach at Sheerness, Latitude 51° 26′ N., Longitude 44° 0′ W., Dip of the Needle 60° 55′ N.

No. of Vibrations	Needle 1		Needle 2		Needle 3			
	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval
	°	M S	°	M S	°	M S	°	M S
	60		60		60		60	
10		1 39		1 34.5		1 29.5		1 30
	48.5		47		42		44	
10		1 37		1 32.5		1 27.5		1 28
	39		37.5		33.5		35	
10		1 37		1 31.5		1 26		1 27
	32.5		30.5		26.5		28.5	
10		1 35.5		1 30.5		1 26		1 26
	27		25		21		23	
10		1 35		1 31		1 25		1 26
	23.5		22		17		19	
10		1 34.5		1 30		1 24.5		1 25.2
	20.5		17.5		14		16	
10		1 34.5		1 30		1 24.5		1 25.3
	16		12.5		10		12	
10		1 34.5		1 30		1 25		1 25
	14.5		12		7.5		10.5	

1819, June 26th. On Ice in Davis' Strait, Lat. 64° 00′ N., Long. 61° 50′ W. distant 222 Yards from the Ships; Dip, 83° 04′ N., by an indifferent Observation.

No. of Vibrations	Needle 2		Needle 3			
	Arcs	Interval	Arcs	Interval	Arcs	Interval
	°	M S	°	M S	°	M S
	60		60		60	
10		2 40		2 32		2 33
	52		42		45	
10		2 36		2 27		2 29
	44		34		37.5	
10		2 35		2 27		2 26
	36		26		32	
10		2 33		2 24		2 24
	32		24		23	
10		2 32		2 24		2 24
	28		19		20	
10		2 32		2 24		2 24
	25		14.5		16	
10		2 32		2 24		2 24
	23		10.5		14	
10		2 31.5		2 24		2 23.5
	21		9		10.5	

1819, July 23d and 24th. On Ice in Baffin's Bay, Lat. 73° N., Long. 61° 30′ N., at a considerable distance from the Ships; the Dip was not observed on the spot, but from other Observations, it must have been about 84° 30′.

No. of Vibrations	Needle 2		Needle 3			
	Arcs	Interval	Arcs	Interval	Arcs	Interval
	°	M S	°	M S	°	M S
	60		60		60	
10		2 54		2 40		2 40
	43		31		38	
10		2 48		2 34.5		2 34
	38		25		27	
10		2 47.5		2 32		2 32.5
	25		16		16	
10		2 45.5		2 32		2 31.5
	22		12		8	
10		2 44		2 33		2 31.5
	20		6		7	
10		2 43.5		2 33		2 32
	18		4		6	
10		2 43.5				
	16					
10		2 43.5				
	10					
10		2 43				
	9					
10		2 43				
	8					

1819, 1820. At the Observatory, Winter Harbour, Melville Island, Lat. 74° 47′ N.; Long. 110° 48′ W. Dip 88° 43′.5.

WITH NEEDLE 1.

Number of Vibrations	July 10, 5 A.M.		July 10, 6 A.M.		July 10, 7 A.M.		July 10, 3 P.M.		July 12, 3 A.M.		July 12, 4 A.M.	
	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval
	° 60	M S	° 60	M S	° 60	M S	° 60	M S	° 60	M S	° 60	M S
10	34	5 50.5	42	5 56	44	5 58	44	5 58	41	5 59.5	42	5 58
10	22	5 43.5	32	5 50	31	5 51	33	5 50	28	5 50	29	5 50
10	14	5 40.5	21	5 43.5	22	5 44	25	5 45	20	5 47	21	5 45
10	11	5 40.5	16	5 40.5	16	5 42	21	5 42.5	14	5 42.5	16	5 40
10	7	5 39.5	13	5 39.5	11	5 41.5	15	5 41	8	5 40.5	11	5 40
10			9	5 40	8	5 40	11	5 39.5			8	5 39

OBSERVATIONS AT WINTER HARBOUR, *continued.*

With Needle 2.

Number of Vibrations	July 7, 6 P.M.		July 7, 7 P.M.		July 7, 10½ P.M.		July 7, 11½ P.M.		July 7, 12½ P.M.		July 9, 7 P.M.		July 9, 9 P.M.		July 9, 10 P.M.		July 10, 4 A.M.	
	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval	Arcs	Interval
	°	M S	°	M S	°	M S	°	M S	°	M S	°	M S	°	M S	°	M S	°	M S
	60		60		60		60		60		60		60		60		60	
10		5 46		5 44		5 49		5 46		5 45		5 45.5		5 48.5		5 47.5		5 44.5
	33		39		39		41		44		43		41		42		43	
10		5 31.5		5 33.2		5 30		5 41		5 38		5 39		5 37.5		5 38.5		5 37.5
	26		30		28		31		28		31		31		29		33	
10		5 28		5 26.4		5 26		5 32		5 26.5		5 34		5 34.5		5 34.5		5 33.5
	20		15		18		20		13		23		23		22		25	
10		5 26		5 26.4		5 26		5 30		5 25		5 31.5		5 33		5 32		5 31.5
	11		11		11		10		9		17		17		17		18	
10	. .	. . .	. .	. . .	. .	. . .	. .	. . .	. .	. . .		5 29.5		5 31		5 29		5 29.5
											13		13		13		13	
10	. .	. . .	. .	. . .	. .	. . .	. .	. . .	. .	. . .		5 28		5 28		5 28		5 29.5
											8		8		8		10	
10	. .	. . .	. .	. . .	. .	. . .	. .	. . .	. .	. . .	. .	. . .	. .	. . .	. .	. . .		5 29
																	7	

With Needle 3.

	Nov. 4, Ther. Zero.		Nov. 5, Ther. −8		April 26, 3 to 5 P.M. Ther. + 5°				July 10, 9 A.M.		July 10, 10 A.M.		July 10, Noon		July 11, 10 A.M.		July 11, Noon	
	60		60		60		60		60		60		60		60		60	
10		5 34.5		5 36.5		5 35.75		5 37		5 37		5 32		5 30		5 36.5		5 39
	43		39		38		41		43		43		43		44		44	
10		5 26		5 29		5 31.75		5 29		5 30.5		5 25		5 19		5 28		5 27.5
	32		27		25		29		31		32		30		33		34	
10		5 20		5 24.5		5 24.5		5 25.5		5 24		5 21.5		5 17.5		5 25		5 22.5
	28		22		15.5		22		23		22		22		25		24	
10		5 17		5 20		5 18.5		5 21.5		5 22		5 15		5 16.5		5 22		5 22
	18		17.5		12		18		16		15		15		18		18	
10	. .	. .		5 16.5	9	5 16.5	12	5 15	11	5 21	11	5 13.5	10	5 16.5	12	5 20	13	5 20
			10															
10	. .	. . .	. .	. . .	. .	. . .	. .	. . .	8	5 20	7	5 13	8	5 13.5	7	5 17	9	5 18

Having thus detailed the Observations on the Intensity of the Magnetic Force, it may not be uninteresting briefly to examine, how far the results are consistent with the ratio in which it was expected that the magnetic force would be found to vary under different Dips of the Needle.

In the Rules and Tables for clearing the Compass from the regular Effect of the Ship's Attraction, printed in 1819 by order of the Commissioners of Longitude, and published, with some alterations and additions, in the *Journal* of the *Royal Institution* for October, 1820, the Magnetic Force in the direction of the Dipping Needle is considered to vary, inversely, as the square root of four diminished by three times the square of the sine of the dip; and the force acting on a needle limited to a horizontal motion, inversely, as the square root of three increased by the square of the secant of the Dip.

The Observations at Melville Island are entitled to principal consideration, as having been made under more favourable circumstances than were presented by the other opportunities of the voyage; they are therefore, to be compared with those which were made in England.

The Dip in London being 70° 33′.3, and at Winter Harbour 88° 43′.5, the force in the direction of the Dipping Needle should increase by calculation in the ratio of 1.153 to 1.

The time of vibration of Mr. Browne's Dipping Needle, decreased between London and Winter Harbour in the proportion of 481 to 446, and consequently the force appeared to have increased in the ratio of 1.163 to 1.

The Dip at Sheerness being 69° 55′, and at Winter Harbour 88° 43′.5, the Magnetic Force should increase by calculation as 1.163 to 1; but the force acting on the horizontal needle should be diminished in the proportion of 13.275 to 1.

The times of vibration of the three horizontal needles increased between Sheerness and Winter Harbour, in arcs from 7 to 14 degrees, respectively, as follow; No. 1 as 339.7 to 94.5; No. 2 as 327.4 to 90; and No. 3 as 316.1 to 85; consequently, the force acting on them appeared to have diminished by No. 1 as 12.93 to 1; by No. 2 as 13.23 to 1; and by No. 3 as 13.83 to 1; the mean being as 13.33 to 1; differing but $\frac{1}{230}$ from the result of the calculation.

This is, perhaps, a nearer agreement with the theory than there was reason to have expected, considering how much the unavoidable causes of uncertainty in such experiments are augmented in high magnetic latitudes.

The results on the 26th of June, and on the 23d and 24th of July, 1819, compared with the observations in England, will also be found to agree as well with the theory as it is reasonable to expect in experiments, where neither time nor circumstances admitted the adoption of the precautions, requisite to ensure the utmost accuracy of which they are capable; and where, perhaps, the moving of the ice during the observations may have introduced an additional error which no care could guard against. By the experiments of the 26th of June, the force had diminished by Needle No. 2, as 2.815 to 1, and by No. 3 as 2.86 to 1; and supposing the Dip to have been 83° 04′, as was found by rather an indifferent observation, the theory would require a diminution of 2.5 to 1. By the experiments of July the force had diminished by Needle No. 2, as 3.28 to 1, and by No. 3, as 3.198 to 1; the calculated diminution being 3.12 to 1.

A description having been given of the instrument with which the preceding experiments were made, it may be proper to add, that the mode of drawing the Needle from its natural direction by a magnet previous to its oscillation, appears objectionable; and might be avoided by a contrivance to retain and release it at any arc at which it might be wished to commence the vibrations; also, that it may be desirable that the silk suspension should be longer than nine inches, especially in experiments in high magnetic latitudes where the force of magnetism is so greatly diminished; and that great attention should be paid to the purity of the brass which may be used in the construction of the instrument.

It may, perhaps, be useful to add a remark, that when the ratio of the Variation of the Magnetic Force shall be thoroughly determined by experiment, the oscillations of an horizontal needle, suspended as above, will become a measure of differences in the Dip of the Needle far more accurate in the higher latitudes than the Dipping Needle; and, consequently, the dip being confidently known at any one place of Observation, it may be determined at others with much greater precision than by the usual method.

The frequent use which was made of the Dipping Needle having suggested

some additions to the Instrument, to facilitate its adjustment, and to conduce towards greater accuracy in the Observation, it has been thought proper to annex a short description of them.

The perfect horizontality of the agate planes which support the axis of the Needle is essential to a correct observation; it has been usual in Dipping Needles hitherto, to intrust this adjustment to spirit levels attached to some part of the frame of the Instrument, placed originally by the maker parallel to the planes; whilst the parallelism is maintained, the adjustment by the spirit levels is correct; but no means were afforded of detecting any change which might have taken place either in the planes, or in the levels, nor of re-adjusting them to each other on any subsequent occasion; to obviate this inconvenience, Mr. Dollond has contrived the following apparatus; it is a double cone, the bases of which are united by a plate, having a diameter greater than the bases, for the purpose of placing the cones upon the agate planes; the apexes of the cones are equal to the diameter of the divided circle of the instrument, and are perfectly at right angles to the plate which unites them; one of the cones is perforated to admit a level, which has the proper adjustments to bring it parallel to the plate.

In using the apparatus the cones are placed upon the agate planes, which are brought into the horizontal position by the foot-screws of the instrument, and by the screws which attach the pieces in which they are held to the cross bars; the errors of the level are shewn by placing the double cone in various positions horizontally, and of the planes by turning the instrument upon its horizontal centre; when these errors are adjusted, the apexes of the cones should coincide with the divisions 90°, and 90° of the circle; if they do not, the adjustments used in levelling must be again referred to, and half the error corrected by the foot-screws, and the remaining half by the screws in the cross bars.

A second addition is for the purpose of retaining and releasing the needle at any arc at which it may be desired to commence the vibrations for determining the intensity of the magnetic force; and is instead of the usual inconvenient and faulty mode of drawing the needle from its natural position by a magnet; it is composed of a moveable ring fitted into the great ring of the instrument, and close to the back of the divided circle; to one part of this ring is attached a double lever, which is acted upon by a spring throwing one end of the lever within the divided circle, so as to support the needle at any division that may be required; to the other end of the lever is attached

a string, passing through a hole in the great ring, which, when drawn tight, releases the needle, by pulling the lever from under it.

A third addition consists of two lenses, applied for the purpose of reading off the arc when the needle has settled; they are of such focal length, and so placed, that the coincidence of the needle with the division can be correctly seen, when the eye is near to, or at a distance from, the lenses; they are borne at the end of two arms, which turn upon a centre fixed to the outside of the great ring.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

APPENDIX VI.

TABLE OF DAYS' WORKS

KEPT ON BOARD THE HECLA.

ASIATIC SOCIETY MUMBAI

Nº VI.

TABLE OF DAYS' WORKS KEPT ON BOARD THE HECLA.

In the following Table, the courses and distances from day to day are those deduced from observation, whenever any was obtained. The common Log made use of in keeping the Dead Reckoning, was marked with forty-eight feet to the knot, and the glass adjusted to run twenty-eight seconds. When the ship was sailing, however, upon one course for several hours together, Massey's Patent Log was used in preference; this invaluable machine was also much made use of, in running bases for the survey.

The greatest care was taken in correcting the courses steered by compass, for the Variation on each direction of the Ship's Head, and for the leeway or drift. The former correction was easily obtained by the habit of invariably observing, morning and evening, by the Sun's Azimuth, whenever that object was visible. By thus attending minutely to the reckoning, it was my particular wish to ascertain whether any general current exists in that part of the Atlantic included between the Shetland Isles, and the entrance to Davis' Strait. By a comparison of the ship's place as deduced from the Dead Reckoning, and that determined by Observation in the months of May and June 1819, a considerable southerly set is perceptible in crossing the Atlantic from the Orkneys to the meridian of Cape Farewell, the error in southing exceeding that in northing by thirty-six miles. This current may be observed in a slight degree daily (with one exception) from the 22d to the 27th of May, between the meridians of 7° and 24° west, amounting in more than one instance, to between eight and nine miles per day; after this, the ship appears to have been set somewhat to the northward while under the lee, as it were, of Iceland, till she had reached the 34th degree of longitude, immediately to the westward of which, the error in southing was from seven to twenty miles for each of three successive days. This latter set was also perceptible, with a few exceptions arising perhaps from unavoid-

able error in the reckoning, as far as the longitude of 48°, the ship having passed between two and three degrees to the southward of Cape Farewell. On approaching the coast of Greenland, immediately to the westward of that promontory, and within the 60th degree of latitude, we perceived the current which has been long known to come round Cape Farewell, and to set to the northward and westward along that shore.

In returning across the Atlantic in October 1820, less regularity was observable in the errors of northing and southing in the dead reckoning, the difference between the ship's latitude by account, and that by observation, constantly varying from day to day, both in direction and amount. With respect to easting and westing, it is remarkable that in crossing the sea both ways, the ship was found to be generally a-head of the reckoning, although, from having made the same remark on the preceding voyage, I was particularly careful in allowing sufficient distance for the ship's run through the water. If this circumstance did not arise from some unavoidable error, which, furnished as we were with excellent chronometers, can scarcely have been the case, it would appear that, between the 57th and 61st degree of latitude, the current sets to the westward in the months of May and June, and to the eastward in October. That the balance of this set is to the eastward is, however, proved by the fact that the bottles, and other floating substances, thrown out in the Atlantic, during several years past, between the parallels of 44° and 61½°, have come on shore in various parts, from the Orkneys to Cape Finisterre, but chiefly on the west coast of Ireland*, and all nearly at the same rate, of five miles per day.

Of the current which we experienced in Davis' Strait and Baffin's Bay, I have already spoken, whenever it occurred, in the course of the foregoing Narrative. By this it would appear that during the summer and autumn there is, in this part of the Polar seas, a considerable set to the southward. In judging of the causes which may produce this general tendency of the superficial current, it will be proper to bear in mind two facts which we have had occasion to remark in the course of this and the preceding voyage; first, that in a sea much incumbered with ice, a current is almost invariably produced immediately on the springing up of every breeze of wind; and secondly, that in several instances where the ships have been beset in the ice, the direction of the

* For this fact, as well as for that respecting the Lagullus Stream, I am indebted to the kindness of Major Rennell.

daily drift has been the point of the compass directly opposite to that of the wind, whether the latter was from the northward or the southward. It appears to me, upon the whole, that the southerly current which we have here been enabled to detect, is not more than may be caused by the balance of northerly winds, added to the annual dissolution of large quantities of snow, which finds the readiest outlet into the Atlantic.

In the Polar Sea, to the westward of Barrow's Strait, no current has been found to exist, beyond that which is evidently occasioned by the different winds. In every part which we had an opportunity of visiting, the tides, though small, appear to be as regular as in any part of the world.

The usual mode of trying the set and velocity of currents, by mooring a boat to a loaded iron-pot let down to a considerable depth under water, would appear to be a very unsatisfactory one. Major Rennell, in the course of his researches on this subject, has found that the Lagullus current to the southward of the Cape of Good Hope, is checked from a W. by S. course to S. W. by the banks of the same name, on which, in that part, the depth of water is one hundred fathoms or more; as the current advances, the repeated checks turn it more and more southward, so that it afterwards runs nearly south, though the depth of water increases. It is not easy, therefore, to say how low such a current may extend, and to what depth the iron-pot must be sunk, in order to ensure its not drifting *with* the boat which it is intended to moor. It may be better, indeed, to try the current in this way, when in deep water, than not to try it at all, but it is evident that a considerable current may exist, when none can thus be detected.

When the water is smooth and moderately deep, perhaps under 200 fathoms, the tide or current is satisfactorily ascertained by a small boat moored to the bottom by a heavy deep-sea lead, or by the deep-sea clamms, an instrument invented by Captain Ross, for bringing up substances from the bottom. This mode was always adopted when practicable, in the course of this voyage.

W. E. P.

DAYS' WORKS on board His Majesty's Ship HECLA.—*May*, 1819.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ☉	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON
	° ′		° ′ ″	° ′ ″	° ′ ″	° ′ ″	
May 21	. . . . .	. . .	. . . . .	59 27 00	3 47 45	. . . . .	Marwick Head (Orkneys) S.½W by Compass.
22	S 77 20 W	99	59 05 16	59 13 42	6 59 24	6 34 39	Cape Farewell {Lat. 59° 42′ N / Lon. 42 57 W} N. 88° 06′ W MILES 1102.3
23	S 74 W	113	58 34 17	58 32 12	10 24 18	10 24 40	„ N 86° 08′ W MILES 1001.4
24	S 68 W	113.3	57 52 16	58 01 40	13 44 41	13 40 27	„ N 82 W 903.4
25	S 68 29 W	117.5	57 08 37	57 10 47	17 08 32	17 01 21	„ N 79 16 W 822.1
26	S 87 12 W	118.7	. . . . .	57 02 58	. . . . .	20 50 31	„ N 77 05 W 715.8
27	S 84 11 W	109.5	56 51 51	56 59 34	24 10 14	23 50 13	„ N 73 59 W 616.8
28	N 45 59 W	49.5	57 26 19	57 13 27	25 16 50	25 07 50	„ N 76 13 W 569.6
29	N 64 58 W	30	. . . . .	57 38 58	26 08 14	25 53 45	„ N 76 50 W 540.2
30	N 86 09 W	107.2	. . . . .	57 46 10	. . . . .	29 16 20	„ N 74 43 W 439.3
31	N 61 54 W	56.5	. . . . .	58 12 46	30 55 58	30 27 02	„ N 76 34 W 389.2

DAYS' WORKS on board His Majesty's Ship HECLA.—*June*, 1819.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON		MILES
June 1	S 86° 14′ W	89.8	58° 06′ 53″	57° 45′ 52″	. . . . .	33° 38′ 48″	Cape Farewell	N 71° 44′ W	303.3
2	S 26 10 W	73.8	57 00 38	57 15 41	34 44 24	34 21 39	„	N 58 11 W	306.1
3	S 11 24 W	64.1	55 57 51	56 17 50	35 07 43	35 03 00	„	N 48 17 W	336.9
4	S 26 56 W	64.8	55 00 33	55 07 21	35 59 02	35 31 05	„	N 39 00 W	362.3
5	N 77 24 W	11.9	. . . . .	55 02 59	36 15 31	36 25 43	„	N 38 01 W	354.1
6	N 62 40 W	42.3	55 21 22	55 21 41	37 28 24	37 48 17	„	N 34 25 W	314.8
7	N 15 34 E	30	55 51 13	55 48 27	37 17 42	37 01 01	„	N 38 35 W	295.3
8	N 28 49 W	40.7	56 26 57	56 27 17	. . . . .	37 44 50	„	N 40 04 W	254.8
9	S 9 47 E	32.9	55 54 48	55 56 09	37 36 42	37 45 56	„	N 36 53 W	284.3
10	N 77 18 W	12.7	55 57 25	56 09 47	38 02 04	37 53 34	„	N 35 15 W	275.2
11	N 64 24 W	75.2	56 29 50	56 24 32	40 05 38	40 12 19	„	N 25 48 W	213.5
12	N 16 13 W	55.5	57 23 09	57 20 44	40 34 02	40 18 41	„	N 28 57 W	158.8
13	N 28 04 W	28.7	57 50 24	57 48 27	40 50 13	40 54 05	„	N 29 06 W	130
14	S 64 43 W	27.4	57 37 16	57 41 03	41 47 28	41 53 37	„	N 16 50 W	130.9
15	S 75 35 W	44.2	. . . . .	57 25 44	43 02 12	43 11 45	„	North	136.3
16	S 72 49 W	159.1	58 12 43	58 33 56	47 46 42	47 01 07	„	N 58 36 E	171.5
17	N 50 16 W	26.9	58 29 29	58 50 56	48 25 13	48 35 30	*Cape of God's Mercy, of Davis	N 47 38 W	574.4
18	N 13 48 E	70.7	59 39 05	59 44 41	. . . . .	47 46 49	„	N 53 38 W	536.9
19	N 38 17 W	13.5	59 48 26	59 48 35	48 09 42	48 08 05	„	N 53 58 W	524.6
20	N 63 35 W	65	60 17 21	60 10 38	50 05 34	49 59 56	„	N 52 42 W	461.6
21	N 63 53 W	133.3	61 16 13	61 08 36	54 11 35	53 35 39	„	N 48 39 W	334.5
22	N 65 36 W	126.6	. . . . .	62 08 18	58 13 32	57 59 43	„	N 39 28 W	218.5
23	N 69 54 W	101.6	62 43 12	62 53 36	61 38 25	60 51 43	„	N 19 25 W	142
24	N 00 48 W	50.3	63 34 24	63 29 57	61 39 53	61 53 38	„	N 29 04 W	94.5
25	N 6 01 E	41.9	64 16 07	64 03 48	. . . . .	61 24 36	„	N 50 16 W	64
26	S 25 43 W Drift	18.4	63 59 29	. . . . .	61 48 07	Beset	„	N 35 59 W	71.1
27	S 23 00 W Drift	13¼	63 46 50	. . . . .	61 59 20	. . . . .	„	N 27 16 W	79
28	S 23 42 W Drift	8.5	63 39 04 By Cole 63° 40′ 11″	. . . . .	62 06 47	. . . . .	„	N 22 45 W	84.5
29	S 38 00 W Drift	9.4	. . . . .	63 31 40	. . . . .	62 17 00	„	N 17 49 W	89.5
30	South	7.4	63 24 15	. . . . .	62 17 00	. . . . .	„	N 16 29 W	90.8

* The Latitude of the Cape of God's Mercy, or Davis, being the Southern Limitation of the entrance into Cumberland Strait, is the most Easterly point of the Continental Land of the Western Shore of Davis's Straits.

DAYS' WORKS on board His Majesty's Ship HECLA.—*July*, 1819.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON	MILES
July 1	N 45° 28′ E	68	64° 11′ 54″ N	64° 12′ 36″ N	60° 32′ 18″	60° 48′ 42″	Cape of God's Mercy N 58° 43′ W	86.9
2	N 39 10 E	85.9	65 18 32	. . . . .	58 25 15	. . . . .	{Possession Bay Lat. 73 31 N Long. 77 22 W} . . N 38 49 W	632.2
3	N 17 29 E	70.9	. . . . .	66 26 08	. . . . .	57 28 06	,, N 43 36 W	586.7
4	N 18 03 E	26	. . . . .	66 50 47	. . . . .	57 07 56	,, N 45 32 W	571.2
5	N 50 20 E	9.2	66 56 38	66 59 11	56 53 22	57 18 41	,, N 46 20 W	571.3
6	N 25 21 W	52.4	67 44 05	67 32 32	57 51 13	58 09 46	,, N 48 7 W	519.6
7	N 22 15 E	44.1	68 24 52	68 22 17	57 05 54	57 07 11	,, N 52 17 W	500.4
8	N 56 56 W	9.3	68 30 01	68 36 52	57 27 25	57 32 50	,, N 52 12 W	491.1
9	N 31 26 W	18.6	68 45 53	68 57 37	. . . . .	57 49 51	,, N 52 55 W	472.8
10	N 22 W	20.1	69 04 28	69 14 17	58 14 55	58 34 17	,, N 54 04 W	453.9
11	N 6 12 W	20.3	. . . . .	69 24 40	. . . . .	58 16 42	,, N 55 49 W	438.4
12	N 30 24 E	21	69 42 44	69 51 04	. . . . .	57 46 13	,, N 58 18 W	434.5
13	N 14 05 E	17.4	. . . . .	69 59 38	57 37 40	57 17 46	,, N 60 19 W	426.9
14	N 27 48 W	36.1	70 17 43	70 31 32	58 27 23	58 13 56	,, N 62 55 W	394.3
15	S 75 58 W	15.7	70 27 42	70 31 43	59 14 57	59 20 05	,, N 61 15 W	381.1
16	N 12 12 W	29.2	70 56 15	70 54 42	59 33 18	59 29 03	,, N 64 38 W	361.3
17	N 4 28 W	64.3	. . . . .	72 00 21	59 53 04	59 41 57	,, N 73 50 W	325.8
18	N 51 11 E	18.5	. . . . .	72 11 57	. . . . .	58 59 07	,, N 76 21 W	334.6
19	N 4 10 W	20.1	72 31 58	72 27 57	59 05 39	58 50 37	,, N 79 35 W	326
20	N 17 16 E	23	. . . . .	72 54 01	. . . . .	58 40 57	,, N 83 29 W	326.4
21	N 4 34 W	4.2	72 58 13	73 05 13	58 43 57	58 35 44	,, N 84 11 W	324.1
22	N 60 39 W	30.1	73 13 23	73 12 13	60 14 21	59 27 35	,, N 86 33 W	292.5
23	S 6 46 E	9.3	73 04 10	73 09 02	60 11 30	60 33 30	,, N 84 51 W	298.9
24	S 4 17 E	4.7	72 59 30	. . . . .	60 08 40	. . . . .	,, N 83 56 W	297.8
25	S 30 30 W	3.4	72 56 37	. . . . .	60 14 29	. . . . .	,, N 83 24 W	300.2
26	N 4 13 E	5.7	73 02 17	. . . . .	60 11 58	. . . . .	,, N 84 27 W	296.7
27	N 39 12 W	3.4	. . . . .	73 05 56	. . . . .	60 22 27	,, N 85 07 W	294.9
28	N 57 27 W	37.7	. . . . .	73 26 14	. . . . .	62 12 09	,, N 88 56 W	256.1
29	N 74 54 W	97.1	. . . . .	73 51 17	. . . . .	67 41 51	,, S 82 55 W	164.8
30	N 84 56 W	121.2	74 01 57	74 04 17	74 59 58	73 55 27	,, S 51 33 W	49.8
31	S 59 37 W	42.5	73 40 24	. . . . .	77 14 20	. . . . .	,, S 11 29	9.6

DAYS' WORKS on board His Majesty's Ship HECLA.—*August*, 1819.

NOTE—The Dead-Reckoning being very uncertain during this and the following month, on account of the total uselessness of the Compasses, and the constant obstruction from Ice, it is not inserted when Observations were obtained.

Day 1819	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON
	° ′		° ′ ″	° ′ ″	° ′ ″	° ′ ″	
Aug. 1	N 24 35 W	16.4	73 55 18	. . . . .	77 40 00	. . . . .	Cape Fanshawe S. 8° E., 19 miles.
2	N 9 23 W	35.2	74 30 03	. . . . .	78 01 02	. . . . .	Cape Osborne, N. 78° W., 13½ leagues.
3	S 82 37 W	35	74 25 29	. . . . .	80 04 28	. . . . .	Cape Warrender, N. 85° W., 29 miles.
4	S 84 41 W	104.7	74 15 42	. . . . .	86 30 35	. . . . .	Burnet Inlet, N. 28° 53′ W., 9¼ miles.
5	S 88 18 W	47.2	. . . . .	74 14 30	. . . . .	89 18 40	Cape Fellfoot, N. 41° E., 22¼ miles.
6	S 5 51 W	22.3	73 52 20	. . . . .	89 27 00	. . . . .	East end of the Northernmost of Prince Leopold's Islands, N. 34° 55′ W., 12½ miles.
7	S 5 09 W	67.5	72 45 15	. . . . .	89 48 12	. . . . .	Distant from place of Observation on the East shore of Prince Regent's Inlet, 1½ mile.
8	S 8 08 W	32	72 13 27	. . . . .	90 03 00	. . . . .	Centre of Fitzgerald's Bay, S. 69° E., 6 miles.
9	N 1 09 W	34.1	72 47 31	. . . . .	90 05 30	. . . . .	Place of Observation on the 7th, S. 74° E., 7 miles.
10	N 13 19 E	5.7	. . . . .	72 53 00	. . . . .	90 01 00	Distant from the East shore of Prince Regent's Inlet, 6 or 7 miles.
11	N 15 56 E	4.4	. . . . .	72 57 15	. . . . .	89 57 00	Do. Do. 6 miles.
12	N 41 11 W	3.2	72 59 40	. . . . .	. . . . .	90 04 00	Do. Do. 9 miles.
13	N 40 55 E	18.3	73 13 25	. . . . .	89 22 23	. . . . .	Port Bowen, S. 80° E., 3¼ miles.
14	N 15 19 E	22.9	73 35 30	. . . . .	88 55 04	. . . . .	East end of Northernmost of Prince Leopold's Islands, N. 28° 30′ W., 10 leagues.
15	N 60 45 E	8.4	73 39 36	. . . . .	88 36 20	. . . . .	Place of Observation, S. 32° 16′ E., 8 miles.
16	N 15 26 E	5.8	73 45 10	. . . . .	. . . . .	88 30 30	South shore of Barrow's Strait, distant 6 or 7 miles.
17	N 58 47 E	6	. . . . .	73 48 20	. . . . .	88 14 00	Do. Do. 6 or 7 miles.
18	N 26 34 E	2.9	73 50 56	. . . . .	88 09 00	. . . . .	North-east point of Northernmost of Prince Leopold's Islands, N. 67° W., 31 miles.
19	N 19 51 E	31.5	. . . . .	74 20 30	. . . . .	87 30 00	Hobhouse Inlet, N. 20° E., 5 miles.
20	N 59 16 W	11.7	. . . . .	74 26 30	. . . . .	88 07 00	Cape Fellfoot, N. 44° 30′ W., 6 or 7 miles.
21	N 85 14 W	34.5	74 29 15	. . . . .	90 19 00	. . . . .	Cape Hurd, N. 54° E., 5¼ miles.
22	N 79 42 W	22.3	74 35 00	74 33 15	. . . . .	90 41 30	Cape Riley, N. 14° W., 8½ miles.
23	S 75 48 W	50.2	74 20 52	. . . . .	94 43 15	. . . . .	Cape Hotham, N. 39 E., 25 miles.
24	N 87 55 W	50.3	. . . . .	74 23 00	. . . . .	97 56 00	S.W. end of Lowther Island, N. 13° E., 5 miles.
25	N 27 36 W	19.7	. . . . .	74 40 30	98 30 30	. . . . .	East end of Garrett Island, N. 26° E., 6½ miles.
26	N 44 43 W	11.8	74 48 47	. . . . .	99 01 15	. . . . .	Centre of Bedford Bay, N. 34° E., 5 leagues.
27	N 72 26 W	43.4	75 01 48	. . . . .	101 39 09	. . . . .	Cape Cockburn, N. 88° E., 19½ miles.
28	N 87 16 W	31.5	75 03 12	. . . . .	103 44 37	. . . . .	East Point of Byam Martin Island, N. 16° E., 9 miles.
29	S 27 59 W	5.8	74 58 06	. . . . .	. . . . .	103 54 42	Cape Gillman, N. 37° W., 5 miles.
30	S 74 29 W	3.7	. . . . .	74 57 15	. . . . .	104 05 30	Do. N. 5 miles.
31	N 75 37 W	4	. . . . .	74 58 00	. . . . .	104 17 15	Do. N. 33° E. 4 or 5 miles.

DAYS' WORKS on board His Majesty's Ship HECLA.—*September*, 1819.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON
	° ′		° ′ ″	° ′ ″	° ′ ″	° ′ ″	
Sept. 1	N 87 24 W	27.7	74 59 35	. . . . .	106 07 36	. . . . .	Point Griffiths, N. 15° 45 E., 4 or 5 miles.
2	S 75 15 W	14.5	74 55 55	. . . . .	106 57 00	. . . . .	Point Ross, S. 81° 43′ W., 5 miles.
3	S 77 54 W	7.1	. . . . .	74 54 00	. . . . .	107 25 00	Ditto, N. 51° E., 2 miles.
4	N 89 08 W	16.9	74 54 49	. . . . .	108 31 44	. . . . .	Centre of Dealey Island, N. 41° W., 6 miles.
5	S 67 49 W	31.8	. . . . .	74 42 45	. . . . .	110 24 30	Cape Hearne, S. 88° W., 4 miles.
6	At single Anchor in Bay of Hecla and Griper				. . . . .	. . . . .	Point Wakeham, N. 64° W., 4 miles.
7	S 37 00 W	17.7	. . . . .	74 32 15	. . . . .	111 07 30	Cape Hearne, N. 36° E., 13 miles.
8	S 68 12 W	8.6	. . . . .	74 29 00	. . . . .	111 37 30	Cape Providence, S. 72° W., 14½ miles.
9	N 56 18 W	2.2					
10							
11							
12			74 30 15	. . . . .	111 43 30	. . . . .	Cape Providence, S. 66° W., 13½ miles.
13							
14							
15							
16	S 61 29 W	14.2	. . . . .	74 23 25	112 29 30	. . . . .	Cape Providence, North, 1½ mile.
17	S 76 54 W	5.3	74 22 15	. . . . .	. . . . .	112 51 00	Cape Hay, N. 78° W., 5½ miles.
18	N 63 31 E	16.4	. . . . .	74 29 30	. . . . .	111 54 45	Cape Providence, S. 60° W., 10½ miles.
19	N 73 26 E	5.2					
20			. . . . .	74 31 00	. . . . .	111 38 00	Cape Providence, S. 66° W., 5 leagues.
21							
22	N 55 29 E	18.5	. . . . .	74 41 30	. . . . .	110 41 20	Cape Hearne, N. 10° E., 1½ mile.
23	In the entrance of Winter Harbour.						

DAYS' WORKS on board His Majesty's Ship HECLA.—*August*, 1820.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON
	° ′		° ′ ″	° ′ ″	° ′ ″	° ′ ″	
Aug. 1	Outer Anchorage of Winter Harbour						
2	S 18 00 W	10¾	74 36 33	. . . . .	. . . . .	111 00 10	Cape Hearne, N. 40° E., 8 miles.
3	S 89 10 W	4.9	74 36 06	. . . . .	. . . . .	111 16 39	Cape Hearne, N. 56° E., 11½ miles.
4	. . . . .	. . .					
5	S 59 02 W	27.8	74 21 49	. . . . .	112 46 35	. . . . .	Cape Hay, N. 76° W., 6 or 7 miles.
6	N 75 06 W	15.2					
7	. . . . .	. . .					
8	. . . . .	. . .					
9	. . . . .	. . .					
10	. . . . .	. . .	74 25 42	. . . . .	113 43 01	. . . . .	Moored to the Beach, near the S.W. end of Melville Island.
11	. . . . .	. . .					
12	. . . . .	. . .					
13	. . . . .	. . .					
14	. . . . .	. . .					
15	N 60 57 W	2.1	74 26 25	. . . . .	113 48 22	. . . . .	Cape Dundas, N. 55° W., 4 or 5 miles.
16	. . . . .	. . .					
17	S 84 52 E	17.9					
18	. . . . .	. . .					
19	. . . . .	. . .					
20	. . . . .	. . .	74 24 50	. . . . .	112 41 33	. . . . .	Cape Hay, S. 78 W., 7 or 8 miles.
21	. . . . .	. . .					
22	. . . . .	. . .					
23	. . . . .	. . .					
24	N 71 34 E	7.9	74 27 19	. . . . .	112 11 32	. . . . .	Cape Providence, S. 56° W., 5¼ miles.
25	. . . . .	. . .					
26	N 71 47 E	4.8	. . . . .	74 28 50	. . . . .	111 56 20	Ditto Ditto, S. 64° W., 10 miles.
27	N 72 36 E	111.1	. . . . .	75 02 00	105 14 20	. . . . .	Point Griffiths, N. 82° W., 4 or 5 leagues.
28	S 87 13 E	67.2	74 58 28	. . . . .	. . . . .	100 46 45	Cape Cockburn, N. 74° E., 6 or 7 miles.
29	S 70 30 E	94.1	74 27 05	. . . . .	. . . . .	95 07 45	S.E. end of Griffith's Island, N. 44 W., 6 miles.
30	S 82 00 E	106.4	74 12 18	. . . . .	. . . . .	88 43 25	S.E. Point of the northernmost of Prince Leopold's Islands, S. 60° W., 7 or 8 leagues.
31	S 82 20 E	138.7	. . . . .	73 53 50	. . . . .	80 25 30	Centre of Catherine's Bay, S. 11° E., 5 or 6 miles.

ASIATIC SOCIETY MUMBAI

DAYS' WORKS on board His Majesty's Ship HECLA.—*September*, 1820.

The Dead Reckoning being very uncertain in the early part of this month, on account of the total uselessness of the Compasses, it is not inserted on those days when Observations were obtained.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON
	° ′		° ′ ″	° ′ ″	° ′ ″	° ′ ″	
Sept. 1	S 56 20 E	105.5	. . . . .	72 55 35	. . . . .	75 19 15	Cape Graham Moore, W.¼S. 5 or 6 leagues.
2	S 27 51 E	51.7	. . . . .	72 09 52	73 57 55	. . . . .	North Extreme, N. 54° W. 11 miles.
3	S 50 50 E	72.2	71 24 20	. . . . .	70 58 48	. . . . .	North Extreme, a headland, N. 61° 14′ W. 13 miles. The entrance to an inlet, S. 21° 59′ W. 5 leagues.
4	S 30 27 E	42.6	71 02 42	. . . . .	70 19 25	. . . . .	Centre of an inlet, S. 46° 23′ W. 3 or 4 leagues.
5	S 56 40 E	32.2	. . . . .	70 45 00	68 57 19	. . . . .	A point of land, having the appearance of three islands, N. 64° 33′ W. distant 8 or 9 miles.
6	N 83 17 E	18.8	. . . . .	70 47 12	. . . . .	67 57 46	Foggy weather;—no land in sight.
7	S 18 55 W	31.9	70 17 00	. . . . .	68 29 00	. . . . .	Within the inlet called the river Clyde.
8	S 82 13 E	22.9	70 13 35	. . . . .	. . . . .	67 24 10	South point of the entrance to the river Clyde, N. 79° 12′ W. 11 miles.
9	S 6 21 E	49.6	69 24 37	. . . . .	. . . . .	67 05 44	Cape Kater, S. 9° E. 4 or 5 leagues.
10	S 8 15 E	27.9	. . . . .	68 56 57	66 56 39	. . . . .	Ditto, N. 4° E. 13 miles.
11	S 26 34 E	41.7	68 19 45	. . . . .	66 05 45	. . . . .	Off the South point of a large and deep inlet; distant from the nearest shore 4 or 5 miles.
12	S 50 23 E	6 9	68 15 20	. . . . .	65 48 39	. . . . .	Ditto ditto 5 or 6 miles.
13	S 86 18 E	6.5	. . . . .	68 15 00	. . . . .	65 36 00	A small but deep-looking inlet, S. 37° W. 6 or 7 miles.
14	N 46 53 E	11.7	68 22 59	68 28 29	65 13 04	. . . . .	S. E. extreme of land visible, S. 34° 58′ E.
15	N 88 17 E	43.3	. . . . .	68 24 18	. . . . .	63 32 42	
16	N 43 43 W	8.0	. . . . .	68 29 49	. . . . .	63 48 00	No land in sight.
17	West	12.1	. . . . .	68 30 08	64 21 07	. . . . .	
18	S 75 44 E	23.5	. . . . .	68 24 03	. . . . .	63 08 12	Cape Farewell, S ° 45 ′ 13 E — MILES 741.0
19	S 39 31 E	46.8	. . . . .	67 54 28	. . . . .	62 02 09	,, S 45 37 E 704.1
20	N 56 16 E	31.9	. . . . .	68 12 11	. . . . .	60 50 19	,, S 42 32 E 692.4
21	S 34 34 E	43.9	. . . . .	67 45 30	. . . . .	60 00 42	,, S 42 58 E 660.8
22	S 71 31 E	26.5	67 37 34	67 59 17	58 57 24	. . . . .	,, S 41 39 E 635.9
23	S 3 43 E	44.1	. . . . .	66 53 03	58 47 50	. . . . .	,, S 44 37½ E 605.6
24	S 4 04 W	30.1	. . . . .	66 23 05	58 53 24	. . . . .	,, S 47 06½ E 589.5
25	S 63 06 E	21.9	66 13 14	66 23 01	. . . . .	58 05 38	,, S 46 28 E 568.0
26	S 39 09 W	41.4	. . . . .	65 41 09	59 09 54	. . . . .	,, S 51 08 E 572.4
27	S 41 36 E	95.6	64 29 37	64 40 59	56 38 59	. . . . .	,, S 53 12 E 480.1
28	S 15 53 E	116.7	. . . . .	62 37 17	55 27 35	. . . . .	,, S 64 09 E 402.2
29	S 13 36 E	98.4	60 19 43	60 28 31	54 17 45	. . . . .	,, S 83 43 E 344.7
30	S 22 18 E	102.6	58 45 51	. . . . .	53 01 51	. . . . .	,, N 79 43 E 314.1

DAYS' WORKS on board His Majesty's Ship HECLA.—*October*, 1820.

Day	Course	Distance in Miles	LATITUDE Mer. Altitude ⊙	LATITUDE D R	LONGITUDE Chronometers	LONGITUDE D R	BEARINGS AND DISTANCE AT NOON		
	° ′		° ′	° ′ ″	° ′ ″	° ′ ″		° ′	MILES
Oct. 1	S 41 19 E	104.5	. . . . .	57 27 19	. . . . .	50 50 45	Cape Farewell	N 61 23 E	281.3
2	S 60 41 E	82.3	56 56 19	57 09 06	49 09 21	48 58 01	,,	N 48 59 E	252.5
3	N 72 53 E	136.9	57 36 37	57 32 19	45 08 57	45 01 09	,,	N 28 47 E	143.1
4	N 77 54 E	97.9	57 57 08	57 57 28	42 06 53	42 19 34	,,	N 13 36 W	135.9
5	N 83 03 E	48.7	58 02 59	58 05 56	40 36 39	40 34 54	Sambro' Head, Shetland,	N 84 59 E	1222.9
6	S 75 37 E	84.5	. . . . .	57 41 58	. . . . .	37 59 51	,,	N 83 36 E	1147.1
7	S 20 16 E	50.9	56 54 11	57 12 44	37 27 20	37 27 53	,,	N 81 13 E	1151.1
8	N 11 54 E	67.1	. . . . .	57 59 45	. . . . .	37 01 34	,,	N 84 17 E	1107.4
9	N 42 44 E	61.9	. . . . .	58 41 51	. . . . .	35 47 40	,,	N 86 19 E	1062.5
10	N 34 23 E	106.5	60 09 39	59 45 45	33 51 58	33 55 16	,,	S 88 51 E	980.1
11	N 52 00 E	99.3	61 10 48	61 05 33	31 11 57	31 36 10	,,	S 84 44 E	881.3
12	N 78 22 E	34.7	61 17 44	61 16 12	30 03 57	30 23 20	,,	S 84 04 E	849
13	S 72 10 E	127.4	60 38 48	60 44 11	25 55 13	26 02 17	,,	S 86 10 E	728.8
14	S 75 22 E	126.7	. . . . .	60 06 46	. . . . .	21 46 01	,,	S 88 27 E	624.4
15	S 12 26 E	55	. . . . .	59 13 07	. . . . .	21 22 25	,,	N 86 32 E	608.9
16	S 20 21 E	51.6	. . . . .	58 24 42	. . . . .	20 47 51	,,	N 81 55 E	606.2
17	S 22 40 E	39.4	57 48 18	57 41 12	. . . . .	20 19 27	,,	N 78 24 E	605
18	S 21 25 E	29.6	. . . . .	57 20 40	19 51 03	19 44 46	,,	N 75 40 E	602.9
19	N 67 29 E	84.3	57 52 57	57 43 43	17 34 21	18 12 41	,,	N 76 56 E	517.6
20	S 66 07 E	32.1	57 40 01	57 34 21	16 40 12	16 52 47	Rockall	East	101.1
21	N 71 59 E	93.4	58 08 52	58 18 49	13 54 11	14 16 38	,,	S 22 36 E	31.9
22	N 30 41 E	65	59 04 50	58 52 22	12 50 43	12 48 54	,,	S 13 59 W	87.9
23	S 76 40 E	40.4	58 55 28	58 56 23	11 34 42	11 33 26	,,	S 38 58 W	97.8
24	N 47 41 E	44.3	59 25 19	59 19 55	. . . . .	10 29 53	,,	S 41 47 W	141.9
25	N 76 54 E	79.4	59 43 16	59 45 16	7 59 31	7 51 43	Fair Island	S 85 42 E	190.7
26	N 80 02 E	113.6	59 55 06	59 58 32	4 19 16	4 47 17	,,	S 71 29 E	82.2
27	N 48 02 E	36.3	60 19 22	60 21 48	3 23 42	3 27 14	,,	S 43 45 E	69.8

APPENDIX VII.

TIDE TABLE IN WINTER HARBOUR, MELVILLE ISLAND, 1820.

The following TABLE contains an Abstract of the Observations registered every Hour in the Hecla's Log-Book. They were made by a Tide-Pole, marked with Feet and Inches, and firmly moored to the bottom.

ASIATIC SOCIETY MUMBAI

TIDE TABLE IN WINTER HARBOUR.

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
May 4	5 45 P.M.	high water		
,,	midnight	. . . . .	1 5	
5	6 A.M.	2 3½	. . . . .	Last Quarter of the Moon.
,,	0 30 P.M.	. . .	2 2	
,,	6 45 P.M.	1 1½	. . .	
6	0 45 A.M.	. . .	1 1	
,,	7 20 A.M.	2 1	. . .	
,,	2 P.M.	. . .	1 11	
,,	8 P.M.	0 11½	. . .	Lowest Tide the third after last Quarter.
7	2 30 A.M.	. . .	0 11½	
,,	9 A.M.	1 11¼	. . .	
,,	4 P.M.	. . .	2 1¾	
,,	11 P.M.	1 5	. . .	
8	4 A.M.	. . .	1 5½	
,,	10 45 A.M.	2 5	. . .	
,,	5 45 P.M.	. . .	2 7½	
,,	11 15 P.M.	2 1½	. . .	
9	5 30 A.M.	. . .	1 11½	
,,	noon	2 9	. . .	
,,	5 45 P.M.	. . .	3 3½	
10	0 12 A.M.	2 11½	. . .	
,,	6 20 A.M.	. . .	2 10	
,,	12 20 P.M.	3 2	. . .	
,,	6 15 P.M.	. . .	3 9	
11	1 A.M.	3 8	. . .	
,,	7 15 A.M.	. . .	3 4	
,,	1 P.M.	3 6½	. . .	
,,	7 P.M.	. . .	3 8½	
12	1 15 A.M.	3 8½	. . .	New Moon.
,,	7 30 A.M.	. . .	3 6½	
,,	1 30 P.M.	3 7	. . .	
,,	8 P.M.	. . .	3 10	
13	1 45 A.M.	4 1	. . .	Highest Tide the second after the New Moon.
,,	8 A.M.	. . .	4 2	
,,	2 10 P.M.	3 9½	. .	
,,	8 15 P.M.	. . .	3 7½	

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
May 14	2 15 A.M.	3 9½	. . .	
,,	8 40 A.M.	. . .	3 8½	
,,	3 P.M.	3 3	. . .	
,,	9 P.M.	. . .	3 3	
15	3 20 A.M.	3 10	. . .	
,,	9 30 A.M.	. . .	3 8	
,,	3 30 P.M.	3 0	. . .	
,,	9 30 P.M.	. . .	3 1	
16	3 30 A.M.	3 8	. . .	
,,	10 A.M.	. . .	3 1	
,,	4 P.M.	2 3	. . .	
,,	10 25 P.M.	. . .	2 6½	
17	4 A.M.	2 9½	. . .	
,,	10 50 A.M.	. . .	2 7	
,,	4 45 P.M.	2 0	. . .	
,,	11 P.M.	. . .	2 0	
18	5 15 A.M.	2 6	. . .	
,,	11 30 A.M.	. . .	2 2½	
,,	5 45 P.M.	1 3½	. . .	
,,	midnight	. . .	1 3	
19	6 A.M.	2 0	. . .	
,,	12 15 P.M.	. . .	1 10½	
,,	6 30 P.M.	1 2	. . .	First Quarter of the Moon.
20	0 30 A.M.	. . .	1 0½	
,,	7 A.M.	1 7½	. . .	
,,	1 P.M.	. . .	1 7½	
,,	8 15 P.M.	1 0	. . .	The lowest Tide the second after the first Quarter
21	2 A.M.	. . .	0 10	
,,	8 30 A.M.	1 9	. . .	
,,	2 25 P.M.	. . .	1 8	
,,	9 P.M.	1 1	. . .	
22	3 15 A.M.	. . .	1 0	
,,	9 30 A.M.	1 6	. . .	
,,	4 10 P.M.	. . .	1 11	
,,	10 30 P.M.	1 6	. . .	
23	4 45 A.M.	. . .	1 4½	

ASIATIC SOCIETY MUMBAI

TIDE TABLE IN WINTER HARBOUR—*continued.*

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
May 23	11 A.M.	1 6	. . .	
,,	5 P.M.	. . .	2 2½	
,,	11 45 P.M.	2 1½	. . .	
24	6 A.M.	. . .	1 5½	
,,	noon	2 0	.	
,,	6 30 P.M.	. . .	1 11½	
25	0 15 A.M.	2 3½	. . .	
,,	6 45 A.M.	. . .	2 2	
,,	0 20 P.M.	2 3½	. .	
,,	6 30 P.M.	. . .	2 11½	
26	0 40 A.M.	2 8½	. . .	
,,	7 15 A.M.	. . .	2 7½	
,,	1 P.M.	2 7½	. . .	
,,	6 30 P.M.	. . .	3 1½	
27	1 25 A.M.	3 5½	. . .	
,,	7 30 A.M.	. . .	3 1	
,,	1 45 P.M.	2 11	. . .	Full Moon
,,	7 50 P.M.	. . .	3 2½	
28	2 A.M.	3 7	. . .	
,,	8 A.M.	. . .	3 0	
,,	2 10 P.M.	3 0	. . .	
,,	8 25 P.M.	. . .	2 11½	
29	2 30 A.M.	3 10	.	Highest Tide the third after full Moon
,,	9 A.M.	. . .	3 7	
,,	3 P.M.	3 3	. . .	
,,	9 P.M.	. . .	3 6	
30	3 A.M.	3 0	. . .	
,,	9 15 A.M.	. . .	3 1	
,,	3 P.M.	2 7½	. . .	
,,	9 30 P.M.	. . .	3 1½	
31	3 50 A.M.	3 7½	. . .	
,,	10 15 A.M.	. . .	3 3½	
,,	3 30 P.M.	2 7	. . .	
,,	10 P.M.	. . .	2 7	
June 1	4 15 A.M.	3 4	. . .	
,,	10 45 A.M.	. . .	3 4	

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
June 1	4 30 P.M.	2 2½	,, ,,	
,,	11 P.M.	. . .	2 3	
2	5 10 A.M.	3 0	. . .	
,,	11 30 A.M.	. . .	2 10½	
,,	6 P.M.	1 8	. . .	
,,	midnight	. . .	1 10½	
3	6 A.M.	2 9	. . .	
,,	0 45 P.M.	. . .	2 6½	Last Quarter of the Moon
,,	7 P.M.	1 9	. . .	
4	1 15 A.M.	. . .	1 7½	
,,	7 30 A.M.	2 9	. . .	
,,	2 P.M.	. . .	2 2½	
,,	8 P.M.	1 6	. . .	Lowest Tide the second after last Quarter of the Moon
5	2 30 A.M.	. . .	1 8	
,,	8 30 A.M.	2 7	. . .	
,,	3 05 P.M.	. . .	2 5½	
,,	9 15 P.M.	1 10½	. . .	
6	3 45 A.M.	. . .	1 8	
,,	9 40 A.M.	2 5	. . .	
,,	4 30 P.M.	. . .	2 10	
,,	10 30 P.M.	2 4	. . .	
7	4 40 A.M.	. . .	2 1½	
,,	10 30 A.M.	2 6½	. . .	
,,	5 P.M.	. . .	2 6½	
,,	11 P.M.	2 6½	. . .	
8	5 30 A.M.	. . .	2 9	
,,	noon	2 10	. . .	
,,	6 10 P.M.	. . .	2 10	
9	0 30 A.M.	2 10½	. . .	
,,	6 40 A.M.	. . .	2 11½	
,,	0 45 P.M.	3 0½	. . .	
,,	6 50 P.M.	. . .	3 1½	
10	0 55 A.M.	3 4	. . .	
,,	7 10 A.M.	. . .	3 3	
,,	1 15 P.M.	2 11	. . .	
,,	7 15 P.M.	. . .	3 1½	

ASIATIC SOCIETY LIBRARY

TIDE TABLE IN WINTER HARBOUR,—*continued.*

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
June 11	1 40 A.M.	3 6½	. . .	Tide next after New Moon, a high one.
,,	8 A.M.	. . .	3 7	
,,	1 50 P.M.	2 11	. . .	
,,	8 P.M.	. . .	3 1	
12	2 45 A.M.	3 6	. . .	
,,	8 35 A.M.	. . .	3 5	
,,	2 50 P.M.	3 0	. . .	
,,	9 P.M.	. . .	3 4	
13	3 30 A.M.	3 8½	. . .	Highest tide the fifth after New Moon.
,,	9 40 A.M.	. . .	3 6½	
,,	3 15 P.M.	2 11	. . .	
,,	9 25 P.M.	. . .	2 11½	
14	3 40 A.M.	3 7	. . .	
,,	10 A.M.	. . .	3 1½	
,,	4 P.M.	3 0	. . .	
,,	9 45 P.M.	. . .	3 2	
15	4 30 A.M.	3 5	. . .	
,,	10 30 A.M.	. . .	3 1	
,,	4 35 P.M.	2 3	. . .	
,,	10 40 P.M.	. . .	2 10	
16	4 50 A.M.	3 3	. . .	
,,	11 A.M.	. . .	2 10	
,,	4 30 P.M.	2 0	. . .	
,,	11 P.M.	. . .	2 1	
17	6 15 A.M.	2 10	. . .	
,,	1 P.M.	. . .	2 7	
,,	7 15 P.M.	2 0½	. . .	
,,	midnight	. . .	2 4	
18	6 A.M.	2 6½	. . .	First Quarter of the Moon.
,,	0 45 P.M.	. . .	2 4	
,,	7 P.M.	1 6	. . .	
19	1 A.M.	. . .	1 5	
,,	7 30 A.M.	1 10	. . .	
,,	1 45 P.M.	. . .	2 0½	
,,	8 P.M.	1 8½	. . .	
20	2 A.M.	. . .	1 8	
June 20	3 A.M.	2 0		
,,	3 P.M.	. . .	1 4	

The Register of the Tides was here discontinued, on account of the difficulty of getting near enough to the Tide-pole to note the height accurately.

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
July 6	11 0 P.M.	high water		
7	5 A.M.	. . .	1 11	
,,	11 45 A.M.	1 10	. . .	
,,	5 30 P.M.	. . .	2 3½	
,,	midnight	2 6½	. . .	
8	6 30 A.M.	. . .	2 4	
,,	12 30 P.M.	2 1	. . .	
,,	6 40 P.M.	. . .	2 6	
9	1 A.M.	2 11	. . .	
,,	6 45 A.M.	. . .	2 10	
,,	1 15 P.M.	2 5½	. . .	
,,	7 20 P.M.	. . .	2 6½	
10	1 40 A.M.	3 3½	. . .	New Moon.
,,	8 A.M.	. . .	3 2½	
,,	2 15 P.M.	2 8	. . .	
,,	8 15 P.M.	. . .	2 8½	
11	2 40 A.M.	3 6½	. . .	
,,	8 50 A.M.	. . .	3 6	
,,	2 40 P.M.	2 7	. . .	
,,	9 P.M.	. . .	3 0	
12	2 40 A.M.	3 9	. . .	Highest tide, the fourth after New Moon.
,,	9 20 A.M.	. . .	3 5	
,,	3 20 P.M.	2 10	. . .	
,,	9 30 P.M.	. . .	2 10½	
13	3 45 A.M.	3 6½	. . .	
,,	10 40 A.M.	. . .	3 5	
,,	4 P.M.	2 8	. . .	
,,	10 15 P.M.	. . .	2 [illegible]	
14	4 15 A.M.	3 7	. . .	
,,	10 30 A.M.	. . .	3 4	

ASIATIC SOCIETY

TIDE TABLE IN WINTER HARBOUR, *continued.*

1820	Mean Time	High Water: Rise from the last low water	Low Water: Fall from the last high water	REMARKS
	H M	Ft. Ins.	Ft. Ins.	
July 14	4 15 P.M.	2 5	. . .	
„	10 30 P.M.	. . .	2 4½	
15	5 A.M.	3 3	. . .	
„	11 15 A.M.	. . .	3 3½	
„	5 15 P.M.	2 6½	. . .	
„	11 P.M.	. . .	2 5½	
16	5 40 A.M.	2 11½	. . .	
„	noon	. . .	2 8½	
„	6 P.M.	2 3	. . .	
„	midnight	. . .	2 4	
17	6 30 A.M.	2 7	. . .	
July 17	0 30 P.M.	. . .	2 6	
„	6 30 P.M.	2 1	. . .	
„	midnight	. . .	2 2	
18	6 30 A.M.	2 5	. . .	First Quarter of the Moon.
„	1 P.M.	. . .	2 3	
„	7 30 P.M.	1 10	. . .	
19	1 30 A.M.	. . .	1 5	
„	7 45 A.M.	2 0	. . .	

The Tide-pole being disturbed by the ice becoming loose about it, the account of the Tides was here discontinued.

GENERAL REMARKS ON THE HEIGHT OF THE TIDES.

In the Months of	Maximum	Minimum	Mean
	Feet Inches	Feet Inches	Feet Inches
May	4 2	0 10	2 6½
June	3 7	1 4	2 7
July	3 9	1 5	2 8½

TIMES OF HIGH WATER ON FULL AND CHANGE DAYS OF THE MOON.

	H M
New Moon, May 12th	1 15
Full 27th	1 45
New . . June 10th	1 15
New . . July 10th	1 40
Mean Time of High Water on Full and Change Days . .	1 29

APPENDIX VIII.

AN ACCOUNT

OF EXPERIMENTS TO DETERMINE THE ACCELERATION OF THE PENDULUM IN DIFFERENT LATITUDES.

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

N°. VIII.

AN ACCOUNT OF THE EXPERIMENTS TO DETERMINE THE ACCELERATION OF THE PENDULUM IN DIFFERENT LATITUDES.

A FULL and detailed report of these experiments has been presented to the Royal Society at whose desire they were undertaken, and will be published in the *Philosophical Transactions;* the present statement is, therefore, confined to a brief notice of their object, nature, and results.

Were the figure of the earth truly spherical, a pendulum would make the same number of vibrations in a given time, under like circumstances of temperature, and of atmospherical pressure, and at equal heights above the level of the sea, in every part of the globe, because the force of gravity which governs the vibrations would be always the same, being at equal distances from the centre of the earth.

The accidental discovery that a pendulum, on being removed from Paris to the neighbourhood of the Equator, increased its time of vibration, gave the first step to our present knowledge, that the Polar axis of the globe is less than the Equatorial, and that the force of gravity at the surface of the earth increases progressively from the Equator towards the Poles.

It has been deemed an important object to science, to determine by experiment the precise amount of the deviation of the figure of the earth from a perfect sphere. This purpose has been attempted either by the actual measurement and comparison of distant degrees of latitude on a terrestrial meridian, or by ascertaining the variation in the force of gravity in different latitudes by means of a pendulum, and thence inferring, by certain known methods, the diminution of gravity from the Pole to the Equator, and the consequent ratio of the Equatorial to the Polar axis.

Such was the object of the present experiments. Their nature may be

briefly described, to consist in ascertaining with the utmost possible accuracy, at different stations the latitudes of which are correctly known, the number of vibrations which would be made by a certain pendulum in a given time, were it placed at the level of the sea, *in vacuo*, and at a certain temperature. This purpose is effected by setting up a clock containing the pendulum in a convenient and protected situation, and by observing the number of vibrations which it makes on an average of several intervals of 24 hours each, accurately determined; the actual circumstances of the temperature, pressure of the atmosphere, arcs in which the vibrations are performed, and the elevation above the sea, being carefully noted, and their effects in retarding or accelerating the vibrations calculated and allowed for.

This operation, which is sufficiently simple in description, proves less so in the performance, by reason of the extreme accuracy which is required in the results, and of the many causes whereby slight errors may be introduced, which demand the utmost precaution and watchfulness to guard against.

The squares of the number of vibrations in 24 hours in the different latitudes, are to each other, as the force of gravitation in such latitudes; and the difference between the Polar and Equatorial diameters is deduced from the acceleration, obtained by comparing the observations at each station successively with those at all the others.

Two clocks were used in these experiments, being the property of the Royal Society, and the same which accompanied Captain Cook round the world.

The pendulums were prepared by Captain Kater; being each cast in one piece of solid brass, and vibrating on a knife-edge of hard steel, on agate plates ground into portions of hollow cylinders.

The experiments were made in the present Voyage, and in the preceding one in 1818; one only of the clocks was employed in the first voyage, but both in the second.

The stations at which the experiments in 1818 were made, were as follow:

At Brassa, one of the Shetland Islands . . Lat. 60° 09′ 42″ N,
At Hare, or Waygat Island, in Davis Strait, Lat. 70° 26′ 15″ N,
And in London . . . . . Lat. 51° 31′ 08″.4 N;

The stations of the present voyage were,

In London, Latitude as before,
At Melville Island, in the Polar Sea, Lat. 74° 47′ 14″.36 N,

And again, in London, on the return of the Expedition.

The observations of the second voyage are deserving of principal consideration, for the following reasons:

1st. The arc of intercepted latitude was greater than between any two of the stations of 1818; the possible errors of observation have consequently had a less influence on the accuracy of the deductions.

2dly. The employment of two clocks afforded a means of procuring double and corresponding results; indeed, as it happened fortunately that each pendulum would fit into either clock, four corresponding results were obtained for the acceleration between London and Melville Island.

3dly. The number of vibrations made by the clocks in London was ascertained by two distinct series of experiments, one before the departure, and a second after the return of the Expedition; the very near agreement of the results on these occasions proving that neither of the clocks, nor any part of their apparatus, had sustained an injury during the voyage, affecting their rate of going; as well as affording a satisfactory inference of the confidence which is due to the mode of experiment; the number of vibrations in 24 hours in London was as follows:

Clock 1	January, 1819	86392.5673	86392.4513	Vibrations in a mean solar day.
	December, 1820	86392.3353		
Clock 2	March, 1819	86496.997	86496.9855	
	December, 1820	86496.9741		

4thly. From the time which was allowed for the experiments at Melville Island being fully sufficient for their completion, the rate of each clock being determined by a mean of 85 intervals of 24 hours each.

And lastly, From the correspondence in the results obtained by the two clocks; the daily acceleration of the one, on a mean of the experiments with both pendulums, being 74.8151 vibrations, and by the other, 74.6528 vibrations. The mean of the two, therefore, 74.734, is considered as the true

acceleration of a pendulum between the latitudes of 51° 31′ 08″.4 and 74° 47′ 14″.36 N.

By comparing, in a similar manner, the experiments made in the Voyage of 1818 with each other, the acceleration of the pendulum between the several stations at which it was tried, has been obtained as follows:

Between London and Brassa . . . 33.107
London and Hare Island 65.2386 } vibrations in a mean solar day.
Brassa and Hare Island 32.1316

The following Table contains the deductions which have been obtained by calculation from these several results.

From the Acceleration between	Diminution of Gravity from the Pole to the Equator	Ellipticity of the Earth
London and Brassa . .	.0055066	$\frac{1}{304.3}$
London and Hare Island . .	.0055139	$\frac{1}{303.6}$
Brassa and Hare Island .	.0055082	$\frac{1}{304.2}$
London and Melville Island	.0055258	$\frac{1}{302.6}$

APPENDIX IX.

REMARKS

ON

THE STATE OF HEALTH AND DISEASE

ON BOARD THE HECLA AND GRIPER.

ASIATIC SOCIETY MUMBAI

REMARKS

ON

THE STATE OF HEALTH AND DISEASE

ON BOARD THE HECLA AND GRIPER.

A VOYAGE distinguished as this has been by a state of salubrity exceeding the most sanguine expectations, may perhaps render interesting a few remarks on the character of the casualties and diseases that did occur; together with a brief view of those circumstances inimical to health, which were so successfully counteracted during the voyage.

The experience of the former voyage had taught us, that, during the summer months, disease of any kind was almost a stranger to the arctic regions, and this voyage confirmed the experience of the last. On securing ourselves in winter quarters in September 1819, there was not a person inefficient from disease on board either ship, excepting one officer, who was suffering under an attack of rheumatism.

At that time the winter was setting in rapidly; the cold had already become severe, and the men began to feel its effects in their extremities, but more particularly in their toes. Among a few of them the injury amounted to no more than the common chilblain, whilst in others it was more severe. In the latter cases, after suffering a short time from the pain of cold, the toes became gelid, colourless, and insensible, until acted on by the stimulus of a warmer atmosphere, when pain ensued, which acquired a degree of almost intolerable acuteness. To prevent an excessive excitement

which followed when these cases were not immediately attended to, we adopted the practice found most useful in cold countries, that of immediately emerging the injured parts in snow, or water kept, by the continual addition of snow, at 32° of Fahrenheit. They were directed to continue this application until some time after the pliability of the part had been restored.

In most of these cases, this plan of treatment did not secure the patient against an accession of inflammation, which although in general superficial, usually terminated in vesication of the whole surface, followed by an exfoliation of the nail and epidermis. After this, the milder cases quickly healed, while in the more severe ones, corrosive ulcerations into the cutis formed, which proved troublesome and tedious in the cure.

A case occurred on board the Hecla which, as it may serve to illustrate the effects of severe cold, I shall particularize.

A house, erected on shore for scientific purposes, caught fire by accident during the winter. A servant of Captain Sabine, in his endeavours to extinguish it, exposed his hands in the first instance to the operation of considerable heat; he afterwards remained in the open air in much distress of mind, at having been in some measure the involuntary cause of the accident, and was almost unconscious of the effects of a temperature of 43° to 44° below zero of Fahrenheit, upon his naked hands. He was at length noticed in this situation, and sent on board.

His hands presented a strange appearance; they were perfectly hard, inflexible, colourless, possessing a degree of translucency, exhibiting more the external character of pieces of sculptured marble, than those of animated matter. They were immediately plunged into the cold bath, where they continued for upwards of two hours ere their flexibility was completely recovered; the abstraction of heat had been so great, that the water in contact with the fingers congealed upon them, even half an hour after they had been immersed. During the cold application, a considerable degree of reaction took place, attended by acute pain, from which the patient became so faint and exhausted as to necessitate his being conveyed to bed. In less

than three hours, very active inflammation had supervened, extending high up the arm, and soon afterwards each hand, from the wrist downward, was enclosed in a bladder, containing upward of a pint of viscid serous fluid. There were, however, three of the fingers of one hand, and two of the other, in which this vesication did not form; they continued cold, and perfectly insensible; and whilst arterial action was powerful, as far as the first joints of these fingers, the vessels of their extremities were in a perfect state of collapsion. During the employment of antiphlogistic remedies to reduce the inflammatory symptoms, various stimuli were used ineffectually, to restore animation to the fingers; when the inflammation began to subside, a separation took place between the dead and the living parts, and eventually the amputation of them became necessary.

A private marine of the Griper had also one of his hands frozen in a similar manner, and with a like result. Mr. Beverly had to amputate three or four of the fingers.

The majority of this sort of injuries took place in the early part of the winter, when the men had not learnt the absolute necessity of extreme caution. The fishermen's boots which they wore, were ill calculated to preserve the warmth of the feet, being formed of hard leather, saturated with salt and grease, and often made too small to admit of a sufficient quantity of stockings to counteract the property they possessed, of being too good conductors of heat. It was not uncommon to see the toes, stockings, and boots cemented together merely by the freezing of the cutaneous exudations of the feet. By a little care, these accidents became less frequent, and subsequently, after Captain Parry had substituted canvass boots in lieu of the leathern, not one case of the kind appeared.

Such were the casualties that formed the sick list for the first three months of the winter; casualties, which from the experience gained by the officers and seamen in the late voyage, may be expected to be totally avoided in any succeeding one; in fact, the preventive means are so completely within control, that it is only in the event of some contingency similar to that which

happened in the case of Captain Sabine's servant, that such an accident ought to occur.

Although the winter was commenced with full confidence in the abundance and efficacy of our resources, we could not be quite indifferent to the many examples on record of the fatality that had attended most of those adventurers, who either by accident or in hopes of commercial profit, had wintered in those climates. With these facts before us, it would have been too much, however sanguine we might have been, to have expected a total exemption from scurvy, and many evils arose during the winter favourable to its production, requiring unceasing vigilance to watch and oppose.

Among the causes which have been considered most active in generating this destructive disease, are to be noticed the following, *viz.*, a diet deficient in quantity or quality; a cold, damp, and impure air; uncleanliness, habits of idleness; mental disquietude; and in short, whatever is capable of producing debility. The absence of a due quantity of acescent vegetable food is always the exciting cause.

In the sea-scurvy, the salted provisions used by the seamen have been held by many to be the most constant cause predisposing to the disease, depending as some think, on the nutritive parts of the meat being dissolved, and lost in the brine; or, according to others, owing to a chemical combination between the salt and the animal fibre, destructive of its nutritious properties. The present unfrequency of the disease in His Majesty's service may induce a doubt whether the rations of the seamen, modified as they are at this time, are capable of producing such a predisposition, without the co-operation of some other powerful remote cause.

In the equipment of the Expedition, however, every measure that appeared conducive to the improvement of the antiscorbutic qualities of the provisions was adopted. A large quantity of the meats preserved by Messrs. Donkin and Co. without salt, as well as of their vegetable and concentrated soups was embarked, and placed at the discretion of Captain Parry, who, by the substitution of them in lieu of proportional quantities of salt beef, greatly

improved the diet of the men. Another deviation from the usual allowance was the employment of good flour instead of biscuit, by which the crews were furnished with a daily supply of well-fermented bread. When to this was added a liberal proportion of lemon-juice, pickles, vinegar, &c., it was reasonable to hope that the exciting cause would not acquire any considerable activity, unless a very strong predisposition prevailed.

Of the remote predisposing causes to which we were exposed from the peculiarity of our situation, a cold and vitiated atmosphere was the most to be dreaded. It is true there was little to be apprehended from the effects of the external air, for during the winter months, which constitute three-fourths of the year, the atmosphere is pure, clear and dry; its mean temperature considerably below zero of Fahrenheit, and rarely undergoing any very sudden change. The clothing of the men was found adequately warm to protect them from the severest cold experienced, which they were enabled to confront not only with impunity, but with a degree of profit and pleasure.

In the interior of the vessels the state of the air was necessarily very different. To economise and preserve a tolerable degree of heat below, it was necessary to keep the hatchways continually covered; the rarefied air which escaped by the flues being replaced through the crevices, and by the occasional opening of the hatchways. In this way, although the renewal of pure air, was abundantly frequent to maintain healthy respiration, the air was seldom of sufficient temperature to carry off the vapours which floated between-decks. These were deposited upon the cold sides of the ships, overhead, and in the bed-places, in icicles, which, by alternately thawing and freezing, kept up a dampness that for some time proved a source of danger, demanding continued attention to obviate its pernicious influence on the health of the crews.

Personal uncleanliness was another evil against which it was difficult to guard. The smoke with which the air was loaded attached itself to the persons and clothing of the men in such quantity as to cause great inconvenience, toler-

able comfort was only to be obtained by frequent ablutions, but the time and the fuel necessary to procure enough water for this and other purposes, created a tendency to neglect the duties of cleanliness, an object that required the constant superintendence of the officers to effect. The greatest difficulty, however, in this respect, arose from the obstacles which opposed the drying of the clothes when washed; for many months there was no other mode of effecting this than by suspending them in the neighbourhood of the stoves and flues, and it was fortunate if by these means a clean shirt was procured once a week.

Various were the modes of occupation, in exercises and recreations, put in practice to counteract a disposition to idleness, the prolific source of discontent and its consequences. The dull monotony of the scene was favourable to habits of sloth, particularly among seamen whose mental resources are too feeble, in general, to enable them effectually to withstand the temptation. As the means employed to obviate these several evils constitute a part of the general system of economy and discipline practised by Captain Parry during the voyage, it is not necessary for me to detail them; the best commentary on the subject is the comparative freedom from disease that prevailed throughout.

Nearly four months had elapsed when the first symptoms of scurvy were observed; this was early in the month of January, one of the severest in the year. The patient was Gunner of the Hecla, a spare man of temperate habits, but with a constitution somewhat worn by servitude in warm climates. This morbid predisposition was increased by circumstances connected with the locality of his cabin, which was situated in the vicinity of a large stove, from which emanated a degree of heat not sufficient to expel the moisture, but quite adequate to keep it in a most comfortless condition; during the day the air was charged with vapour, which at night froze to every adjacent substance. On examining his bed, one side was found to be literally drenched in water, and the other frozen to the bed-place. Under such circumstances it was astonishing that scorbutic symptoms should have appeared. Their

character, nevertheless, was remarkably mild. The removal of the patient from his damp cabin, into a hammock in a dry part of the vessel, the substitution of fresh meat and vegetable soup, instead of the salted portion of his diet, and a small additional allowance of lemon-juice sufficed to subdue every symptom in three weeks after the attack, and he braved the rest of the voyage on the diet of the ships' company without any recurrence of the complaint.

Early in March two more cases appeared almost simultaneously, one corresponding closely to the foregoing in its origin and result; the other differing, inasmuch as the subject was a man who had occupied one of the most comfortable beds in the ship; but he had been more than once, while in the service of the East India Company, a sufferer from scurvy; his predisposition was also increased by a pernicious habit of eating pork slush. This substance is the more oily part of the fat, which has so great an affinity for the salt, that during the boiling they are discharged together, leaving the meat in a relative state of freshness. The use of this briny fat is strictly prohibited; but this man was detected by the crew in the act of purloining and eating it, and they, with a praise-worthy zeal for the welfare of the Expedition, reported his delinquency.

A fourth case shewed itself in April; the patient was the Greenland mate, employed as a pilot. He had occupied a part of the gunner's cabin, and had, consequently, been exposed to the more tardy operation of the same morbific agents. The remedies used in the first case, were equally successful in the others; but I omitted to notice some auxiliary articles of food which, doubtless, very much accelerated their recovery. These were occasional puddings of preserved fruits, and frequent small salads of mustard and cress forced, with some difficulty, by Captain Parry, in his cabin.

A solitary case of diseased lungs occurred during the voyage, which, in its progress, was combined with scorbutic symptoms. As this case eventually proved fatal, I shall, at the request of Captain Parry, subjoin an abstract of it.

William Scott was entered on the sick list on the 12th of April, having an

attack of inflammation of the lungs, which had been ushered in by the usual symptoms of fever. Copious bleedings and abstinence relieved him, but on the 14th he had a relapse, which also yielded to similar treatment. On the 24th, he was in an advanced state of convalescence, when a diarrhœa supervened which arrested his progress towards recovery. The symptoms were mild, and seemed to arise rather from the irritation produced by acrid matter in the intestinal canal, than from any organic derangement. Medicine suitable to that view of the case was administered with considerable, though not perfect, relief. At this time also some symptoms of a scorbutic character were apparent, which in the beginning of May were no longer equivocal, consisting of aversion to motion, lassitude, depression of spirits, pale countenance, fetid breath, livid, spongy, bleeding gums. An antiscorbutic and farinaceous regimen was prescribed, with such occasional laxatives and anodynes as were dictated by the state of his bowels. By the 25th the decided symptoms of scurvy had given way; the paleness, debility, and mental anxiety, remaining. The last affection had clung to him throughout, diverted at times by such light occupations as were found to suit him. He had also suffered two or three relapses of the diarrhœa. The acescent portion of his diet was now discontinued, and the bitter tonics substituted; in addition to his farinaceous food, he had daily a nutritious broth of the ptarmigan, of which a few were shot. Under this treatment he appeared to be improving, until the 29th, when he had a recurrence of diarrhœa. The appearance of the alvine feculæ, and a sense of uneasiness, felt by percussion, in the region of the liver, indicated a derangement of the hepatic system. Five grains of the blue pill were prescribed daily until the 7th of June, when the salivary glands becoming excited, it was omitted. While under its influence, which continued a fortnight, the uneasiness in the right hypochondrium ceased, but the bowels continued at intervals disordered. On the 10th he began to feel his respiration hurried, on exposure to the cold; general lassitude and debility; increasing pallidity of countenance, and livid lips, with extraordinary depression of spirits. These symptoms were suspicious, but the principal

diagnostic signs of scurvy were wanting; his pulse was small and frequent, skin cold; his appetite for food under these circumstances was, nevertheless, tolerable. His treatment had now for its main object the restoration of strength, and to sooth the occasional intestinal irritability. On the 19th he for the first time experienced an indescribable sensation of præcordial anxiety, and on the same night he had a short fit of dyspnœa and cough, increased rapidity and weakness of pulse, without pain or fever indicative of inflammatory action. This state of anxiety continued until the 26th, when a stupor supervened, from which he was roused by the irritation of a vesicatory; a degree of incoherence was perceptible during the day, which increased in the evening, and by midnight had become furious delirium. In spite of his debility, he was with difficulty held in his bed, anxious to escape imaginary dangers, and attempts upon his life. It was midnight of the 27th, before this mental agitation subsided, leaving him in a rational state, but exhausted by his struggles, and evidently sinking apace. On the 29th he relapsed again into a stupor, almost unconscious of surrounding objects, and on the morning of the 30th he breathed his last.

On opening the body after death, about two pints of serum were found in the cavity of the abdomen, the liver was preternaturally enlarged, but in other respects sound; a few of the mesenteric glands were indurated; the rest of the abdominal viscera offering no morbid appearance.

In the thorax, the pericardium contained three or four ounces of fluid. The heart was small, its parietes attenuated, flaccid, and pale, and its cavities filled with firm coagulated lymph.

Both lungs were collapsed and shrunk to half their natural bulk, externally firm and livid, on making incision into them. The parenchymatous substance appeared condensed, and converted into a liver-like substance of a livid hue. There was no sign of tubercle or abscess, nor was there any exudation into the cavity of the chest, or adhesion of the pleura.

The morbid state of the thoracic viscera, discovered by the dissection, elucidated many of the distressing symptoms, the cause of which was in-

volved in so much obscurity; but it leaves the pathology of the disease very imperfect.

The diseased condition of mind under which this poor man laboured, had been much aggravated by circumstances which only transpired a short time before his death. He had unfortunately a propensity to liquor, and it appeared that he had been in the habit of gratifying his desire by means of those illicit barterings among seamen, which it is so difficult to detect. A nocturnal incontinence of urine was the consequence, which had been a source of annoyance to his messmates, ending in a powerful antipathy to him manifested in their unwillingness to assist him even in his sickness. The consciousness of this had evidently been long preying upon his mind.

The above cases comprehended all in which scorbutic symptoms were manifest; no other of the crew evinced the slightest disposition thereto; although in the early part of April, in consequence of the serious loss of lemon-juice by the bursting of the bottles by the frost, it had been deemed necessary to reduce the consumption of it one-third; and in the middle of June to discontinue it entirely. At this period the sorrel (*Rumex Digynus, Linn.*) began to vegetate, and the men were enjoined to gather daily a prescribed quantity; during the whole of July it increased almost to exuberance, proving a most valuable antiscorbutic.

In May two or three cases of pulmonic inflammation entered the sick-list; and in June two of diarrhœa, among the parties employed in procuring game. Among the sportsmen, and also among the party which travelled across the island in June, a few cases occurred of that species of ophthalmia called snow-blindness, produced by the reverberation of the solar rays from the surface of the snow. The inflammation is not excessive, but the irritation is for many hours very distressing. Refrigerant applications, and in severe cases alternated with warm fomentations, generally allayed the irritation in twenty or thirty hours, and in three or four days the patient was fit for service.

The foregoing remarks apply more particularly to the state of health on board the Hecla. In the Griper the scorbutic symptoms were of a more

aggravated character, obviously resulting from the objects attacked being men of more debilitated constitutions. The remote causes depending on the condition of the atmosphere, were also more powerful in this vessel than in the Hecla: for, in consequence of the contracted space in which they lived, the air was charged with moisture which was deposited so plentifully upon the walls and bed-places, that every effort to preserve dryness was fruitless. In this extremity it at length became necessary to put all the men into hammocks, and to break down the bulk-heads and bed-places, thereby throwing open the whole deck to the influence of the fires. This measure proved effectual in removing the nuisance, and with it the disposition to disease.

ASIATIC SOCIETY MEDICAL

THE END.

ASIATIC SOCIETY MUMBAI

THE following ERRATA occur in the *Noon Longitudes* in the Narrative, in consequence of having inadvertently inserted those by Chronometer No. 228, instead of those by the mean of the whole number employed.

Page	4,	line	3,	from the bottom,	*for*	°	′	″	*read*	°	′	″
						25	11	51		25	16	50
—	7,	—	7,		—	48	61	59	—	48	09	43
—	7,	—	2,	from the bottom	—	61	32	49	—	61	38	25
—	8,	—	8,		—	61	34	28	—	61	30	53
—	8,	—	4,	from the bottom	—	61	42	53	—	61	48	07
—	11,	—	9,	do. do.	—	56	47	56	—	57	07	56
—	12,	—	9,		—	57	46	26	—	57	51	13
—	12,	—	4,	from the bottom	—	57	09	43	—	57	05	54
—	13,	—	5,		—	57	22	57	—	57	27	26
—	13,	—	20,		—	58	10	39	—	58	14	55
—	14,	—	4,	from the bottom	—	57	32	56	—	57	37	40
—	15,	—	7,		—	59	11	58	—	59	14	57
—	16,	—	3,		—	59	46	18	—	59	43	04
—	17,	—	16,		—	59	43	54	—	59	05	39
—	18,	—	0,		—	58	42	17	—	58	43	57
—	19,	—	12,		—	60	09	07	—	60	11	30
—	19,	—	4,	from the bottom	—	60	07	54	—	60	09	40
—	20,	—	7,	do. do.	—	60	11	52	—	60	11	55
—	21,	—	6,	do. do.	—	60	24	27	—	60	22	27
—	24,	—	7,		—	75	02	14	—	74	5	054

A SUPPLEMENT *to the* APPENDIX, *containing the* ZOOLOGY, BOTANY, GEOLOGY, *&c., of the Arctic Regions, will be published on the* 1*st of June.*

ASIATIC SOCIETY MUMBAI

00085367

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

ASIATIC SOCIETY MUMBAI

Digitized with financial assistance from the
Government of Maharashtra
on 03 February, 2016